

# ABSTRACTS

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**1 A meta-analysis evaluation of feeding MGA® to feedlot heifers implanted with TBA.** J. Wagner and N. Davis\*, *Colorado State University, Fort Collins.*

A mixed models approach was used to study the use of MGA in the diet of feedlot heifers implanted with TBA. One hundred and one treatment means from 18 research trials were included in the analyses. Interactions between MGA and implant treatment were important ( $P < 0.10$ ) for finished weight, average daily gain (ADG), feed efficiency (FE), hot carcass weight (HCW,  $P < 0.12$ ), and ribeye area (REA), suggesting that the effect of MGA on these measurements depended upon how the heifers were implanted. For non-implanted heifers, MGA improved FE and increased finished weight, ADG, dry matter intake (DMI), HCW, yield grade (YG), and the percentage of YG 4 and 5 carcasses. Feeding MGA appeared less effective in heifers implanted with multiple implants, especially combinations of estrogen and TBA, compared with non-implanted heifers or heifers implanted with a single implant.

**Key Words:** MGA, Heifers, Implants

**2 Reproductive performance in early postpartum Rambouillet ewes and prepubertal ewe lambs treated with intravaginal progesterone.** J. M. Benavidez\*, M. J. Hendricks, R. L. Knight, L. D. Abercrombie, and D. M. Hallford, *New Mexico State University, Las Cruces.*

Two experiments examined effects of intravaginal progesterone (P4, CIDR; 0.3 g P4) on return to estrus in early postpartum ewes and onset of puberty in ewe lambs. In Exp. 1, 18 Rambouillet ewes ( $72.4 \pm 3.9$  kg) were assigned to 1 of 3 treatments ( $n = 6/\text{group}$ ) on d 10 (d 0 = parturition). Treatments were no CIDR (control), CIDR for 5 d (d 10 to 15), and CIDR for 12 d (d 10 to 22). Blood samples were collected daily after lambing and ewe and lamb BW were recorded every 10 d through d 60. Before CIDR insertion on d 10, serum P4 was less than 1 ng/mL in all ewes. On d 11, serum P4 was 0.3, 2.3, and 2.8 ( $\pm$

0.2) ng/mL in control ewes and those in the 5- and 10-d CIDR groups, respectively ( $P < 0.01$ ). Serum P4 declined to control values 1 d after CIDR removal. Ewe BW did not differ among treatments ( $P > 0.66$ ) and ewes remained anestrus after CIDR removal. On d 20, lambs born to ewes in the 5-d CIDR group, ( $11.4 \pm 0.3$  kg) tended to weigh less ( $P = 0.07$ ) than lambs born to control ewes ( $12.4 \pm 0.3$  kg) or ewes receiving CIDR for 12 d ( $12.0 \pm 0.3$  kg). Lambs born to control ewes ( $16.3 \pm 0.5$  kg) tended to weigh more ( $P = 0.07$ ) on d 30 and d 60 ( $26.6 \pm 0.8$  kg) than lambs born to ewes in the 5-d ( $14.6 \pm 0.5$  kg d 30,  $23.8 \pm 0.7$  kg d 60) or 12-d ( $15.0 \pm 0.5$  kg d 30,  $24.0 \pm 0.7$  kg d 60) CIDR groups. In Exp. 2, 20 prepubertal spring-born Rambouillet ewe lambs ( $193 \pm 1.6$  d of age;  $38.8 \pm 1.0$  kg) were treated with either no CIDR (control,  $n = 12$ ) or CIDR ( $n = 8$ ) for 7 d. Serum samples were collected daily and BW were recorded every 20 d. Puberty was determined by serum P4 values  $> 1$  ng/mL for 3 or more days. Serum P4 was elevated ( $P < 0.01$ ) in CIDR-treated ewe lambs compared with controls on all days when the CIDR was in place (P4 was 2.9 to 5.2 ng/mL in CIDR-treated ewes and 0.3 ng/mL or less in controls). One of 8 (12.5%) CIDR-treated ewe lambs exhibited puberty after treatment whereas 4 of 12 (33%) control ewe lambs exhibited puberty. Treatment with a CIDR elevated serum P4 in postpartum and prepubertal ewes and resulted in decreased lamb BW but failed to induce estrus in early postpartum ewes or in prepubertal ewe lambs.

**Key Words:** Sheep, Puberty, CIDR

**3 Heterogeneous variance of docility scores in Limousin cattle.** D. W. Beckman\* and D. J. Garrick, *Colorado State University, Fort Collins.*

Analyses of docility in Limousin cattle have shown models including maternal or sire by herd interactions as random effects fit significantly better than a model limited to direct genetic and residual random effects. The variance of docility scores between herds is not homogeneous due to the subjective nature of scoring, with some breeders avoiding use of undesirable scores. Most sires have very few progeny and are

represented in only a single herd, whereas a very small proportion of sires are widely used across herds. Sire effects that contribute to the estimation of variance components may therefore exhibit heterogeneity, biasing the apparent fit of models that assume homogeneity. The objective of this study was to determine whether maternal or sire by herd interaction effects are appropriate, or an artifact of the nature of this data. Heterogeneous variance was examined in a two-step process. First, absolute estimated residuals were obtained from a model with direct genetic, maternal genetic, sire by herd interaction and residual random effects. Second, these were analyzed in a fixed effects model using SAS. Results indicated sire by herd ( $P = 0.0268$ ) was significant. However, the sums of squares for herd effects ( $F = 4.62$ ) was nearly twice that of sire effects ( $F = 2.68$ ), and over four times that of the sire by herd interaction ( $F = 1.09$ ), implying herd effects account for most of the heterogeneity observed in docility scores. Absolute residuals were further analyzed in a random effects model using ASReml. As expected, there was no genetic variation in direct or maternal genetic effects. However, the proportion of phenotypic variance accounted for by the interaction between sire and herd was  $0.02 \pm 0.01$ . These results imply the significance of maternal and sire by herd interaction effects inferred by previous research is, in fact, an artifact of the data. Heterogeneous variance due to herd effects is likely a result of the subjective method used to allocate docility scores.

**Key Words:** Beef Cattle, Heterogeneous Variance, Temperament

**4 Effects of MGA and PG600 on fertility in Rambouillet ewes outside the normal breeding season.** E. J. Windorski<sup>\*1</sup>, C. Schauer<sup>2</sup>, D. Pearson<sup>2</sup>, A. Wurst<sup>3</sup>, E. K. Inskip<sup>3</sup>, and J. S. Luther<sup>1,2</sup>, <sup>1</sup>*Department of Animal & Range Sciences, North Dakota State University, Fargo,* <sup>2</sup>*Hettinger Research Extension Center, North Dakota State University, Hettinger,* <sup>3</sup>*Davis College of Agriculture, Forestry, and Consumer Sciences, Morgantown, WV.*

The effects of melengestrol acetate (MGA) and PG-600 on ewe fertility outside the normal breeding season were evaluated. In April, Rambouillet ewes at the Hettinger Research Extension Center (46°N) were assigned to one of four groups: 1) control (C, n=98); 2) PG600 (n=98); 3) MGA (n=100); 4) MGA+PG600 (n=100). A commercially prepared pellet with or without MGA was fed at 0.15 kg (0.3 mg of MGA) ewe<sup>-1</sup> d<sup>-1</sup> for 7 d. On the last d of pellet feeding ewes received a 5-mL injection of PG600 (400 IU PMSG and 200 IU hCG) or saline. Thereafter, ewes were exposed to intact rams for a 31-d breeding period (1 ram:15 ewes). Transrectal ultrasonography was performed between d 20 and 25 of gestation for ewes marked during the first 6 d of the breeding period, and the numbers of corpora lutea and embryos were counted. During the first 6 d of the breeding period, MGA increased ( $P < 0.10$ ) the percentage of ewes mated and conceived when compared to C and PG600. Relative to MGA, ovulation rate was enhanced ( $P < 0.03$ ) in MGA+PG600 (1.53 +/- 0.13 vs. 2.38 +/- 0.42 corpora lutea, respectively), however as gestation progressed the number of embryos (1.5 +/- 0.13 vs. 1.8 +/- 0.16, respectively) and lambs born (1.3 +/- 0.15 vs. 1.5 +/- 0.27, respectively) remained similar. During the entire 31 d breeding period, all groups achieved high rates of pregnancy (77 to 80%). MGA treatment reduced ( $P < 0.01$ ) the interval from ram introduction to lambing when compared to groups that did not receive MGA (168 +/- 0.8 vs. 171 +/- 0.6 d, respectively). The total number of ewes conceiving, lambing rate, and mean lamb birth weight were not affected by treatment. In conclusion, MGA was a useful tool for shortening length of the lambing season, and

although PG600 enhanced ovulation rate, it had no beneficial effects on ewe productivity.

**5 Effects of bunk scoring on feedlot steer intake.** J. Schutz<sup>\*</sup>, J. Wagner, and T. Engle, *Colorado State University, Fort Collins, CO.*

One hundred twenty seven crossbred yearling steers (497 kg ± 34) were utilized to determine which bunk score yielded the greatest dry matter intake. Steers were randomly sorted into pens and placed into one of three groups. A 3 X 3 Latin square design was utilized. Each of the three groups were randomly allotted to an initial bunk score assignment and were rotated through each of the three bunk scores. The bunk score system utilized a numeric score based on the amount of daily orts from the previous days feeding; a score of 0 was a bunk devoid of all feed particles, a score of ½ was from trace-2.26 kg of orts and a score of 1 was 2.27-9.05 kg of orts. An adaptation period of 9 days was implemented between each change in bunk score assignment to allow the group adequate time to adjust to the change in feed delivery. During the data collection phase all bunks were read at 0630, 1630, 2200, and 0200 the next morning. Each morning bunk scores were allotted and feed intake was determined by weighing the orts in each bunk. Dry matter intake was greater ( $P < 0.0001$ ) for steers in the group which consistently received enough feed to ensure 2.27-9.05 kg of orts each morning. By allowing a controlled ad libitum bunk environment, daily intake was increased which could result in increased performance and decreased days on feed. Additionally, when feed remains in the bunk throughout the night it can be assumed that all steers have access to the feed in a time frame that supports potential diurnal eating patterns.

**Key Words:** Bunk Management, Feed Intake, Feedlot

**6 Receptor Transporting Protein-4 (RTP-4) expression and localization in the ovary and endometrium of cyclic and early pregnant ewes.** C. A. Gifford<sup>\*1</sup>, A. A. Assiri<sup>2</sup>, M. C. Satterfield<sup>3</sup>, T. E. Spencer<sup>3</sup>, and T. L. Ott<sup>4</sup>, <sup>1</sup>*University of Idaho, Moscow,* <sup>2</sup>*Washington State University, Pullman,* <sup>3</sup>*Texas A&M University, College Station,* <sup>4</sup>*The Pennsylvania State University, University Park.*

Interferon-tau (IFNT) is a type I interferon secreted by trophoblast that is the signal for maternal recognition of pregnancy in ruminants. IFNT regulates expression of genes in the endometrium, peripheral blood leukocytes (PBL) and corpus luteum (CL). Expression of a novel G-protein coupled receptor transporter (RTP4) increased in the endometrium and PBL during early pregnancy. Here we quantify expression of RTP4 in CL of cyclic and early pregnant ewes and determine localization and size of the RTP4 transcripts in the ovary and endometrium. Ewes were randomly assigned to be bred to a vasectomized (cyclic) or intact ram (pregnant). Tissues were collected at 11, 13, 15 (n = 4/status/day), 17 and 19 (pregnant only; n = 4/day) days after mating. Total RNA was isolated and analyzed for levels of RTP4 mRNA in CL and transcript size in endometrium and CL. Northern blot analysis revealed the expected 1.6 kB band and an unexpected 2.6 kB band. Levels of RTP4 mRNA were not different ( $P > 0.10$ ) to day 15; however, RTP4 levels were elevated over 14- and 6-fold on days 17 and 19 of pregnancy, respectively. In situ hybridization localized expression of RTP4 to the glandular epithelium,

stratum compactum and caruncular stroma. RTP4 was ubiquitously expressed in luteal cells, and in an uncharacterized population of immune cells. Results show that an alternate form of RTP4 mRNA may exist in sheep and that RTP4 mRNA levels are regulated in the ovine CL during early pregnancy. Regulation of RTP4 during early pregnancy may contribute to the complex signaling cascade associated with pregnancy recognition in this species.

**Key Words:** Ovine, Pregnancy, RTP4

**7 Stayability to alternate ages.** B. W. Brigham\*, S. E. Speidel, R. M. Enns, and D. J. Garrick, *Colorado State University, Fort Collins*.

Beef cattle stayability is traditionally defined as the probability a cow will still be in the herd at six yrs of age given she has calved once. Genetic evaluation is based solely on success/failure observations of females reaching age six, no account is made for daughters not yet six or staying beyond six yrs. This approach has been contested as inadequate by researchers and cattlemen because sires have low accuracy until at least eight yrs of age. Cows in production at four yrs of age have a higher probability to remain in the herd until six yrs of age and such information should be used in an evaluation. Failure to stay in the herd can be caused by voluntary or involuntary culling. Accordingly, genetic and environmental factors influencing stayability may vary at different ages. This could alter heritabilities and the magnitude of genetic correlations between different ages. The objective of this study was to estimate heritability using alternate definitions to three, four, five and six yrs of age and to compare resulting EPD. Data from the American Gelbvieh Association, Red Angus Association of America and American Simmental Association, was used separately to compare estimates of stayability between the different ages. Variance components were estimated from a sire model using a probit threshold model including contemporary group as a fixed effect. Estimates of stability heritability were similar across breeds and averaged 0.19, 0.20, 0.21, and 0.21 for to three, four, five and six yrs, respectively, indicating stayability calculated at earlier ages are nearly as heritable as the current six yr definition. Estimated heritabilities were then used in a threshold animal model to obtain EPD. Sire EPD at different age designations varied. The correlations of sire evaluations using independent datasets with daughters at the different ages ranged from 0.04 to 0.82. Therefore, future research which combines estimates from all ages into a single value should be developed. This would provide more accurate evaluation at earlier ages but retain the current interpretation of the published EPD.

**Key Words:** Beef Cattle, Longevity, Stayability

**8 Duodenal flow and intestinal disappearance of fatty acids in lambs fed safflower fatty acids in the form of whole seeds, cracked seeds, or oil extracted from seeds.** P. L. Price\*, V. Nayigihugu, C. M. Murrieta, D. C. Rule, and B. W. Hess, *University of Wyoming, Laramie*.

Four wether lambs ( $45.5 \pm 3.4$  kg BW) fitted with ruminal, duodenal, and ileal canulas were used in a 4 x 4 Latin square experiment to determine effects of safflower seed processing on site and extent of fatty acid digestion. Isonitrogenous diets were 33% ground (2.54 cm)

hay, 67% concentrate (Control), with safflower lipid replacing enough of the concentrate to provide 3% added fat from either high-linoleate whole or cracked safflower seeds or oil extracted from the seeds. Orthogonal contrasts included Control vs. fat-supplemented diets, and linear and quadratic effects of degree of safflower seed processing (whole, cracked, and oil). Duodenal flow of 18:1c9 was greatest ( $P = 0.03$ ) for Control, but flow of biohydrogenation intermediates 18:1t9 ( $P = 0.08$ ), 18:1t11 ( $P = 0.07$ ), 18:1t12 ( $P = 0.02$ ), 18:1t13 ( $P = 0.02$ ), 18:1c11 ( $P = 0.03$ ), and 18:1c12 ( $P = 0.11$ ) were least for Control lambs. Duodenal flow of 18:0 in Control lambs was nearly half ( $P < 0.001$ ) that of lambs supplemented fat. Quadratic responses for duodenal flow of 18:2c9t11 ( $P = 0.01$ ), 18:2t10c12 ( $P = 0.07$ ) and 18:2c9c12 ( $P = 0.09$ ) were due to greater flow of those fatty acids in lambs fed oil. Apparent small intestinal disappearance (g/d entering the duodenum) of 16:0 ( $P = 0.02$ ), 18:0 ( $P = 0.002$ ), 18:2c9t11 ( $P = 0.01$ ), and 18:2t10c12 ( $P = 0.09$ ) were greater for fat-supplemented lambs than Control. Percentage of 16:0 ( $P = 0.05$ ) and 18:0 ( $P = 0.01$ ) disappearing from the small intestine demonstrated a quadratic response because lambs fed oil had the lowest disappearance values for those fatty acids. Percentage of 18:2c9c12 digested in the small intestine, however, was greater (quadratic,  $P = 0.08$ ) in lambs fed oil. We conclude that duodenal flow of biohydrogenation intermediates increased when lambs were fed fatty acids from safflower seeds. Supplementing fatty acids in the form of extracted oil seems to be the most effective strategy to increase status of linoleic acid and biohydrogenation intermediates in lambs fed diets containing 3% added fat.

**Key Words:** Lambs, Supplementation, Safflower Seeds

**9 Significant association of corticotropin-releasing hormone gene with marbling and subcutaneous fat depth in Wagyu x Limousin crosses.** T. Wibowo\*, J. J. Michal, and Z. Jiang, *Washington State University, Pullman*.

Corticotropin releasing hormone (CRH) gene is mapped on bovine chromosome 14 (BTA14), where more than 30 fat-related quantitative trait loci have been reported in dairy and beef cattle. The gene regulates secretion of adrenocorticotrophin hormone, the hypothalamic-pituitary-adrenal axis and multiple hypothalamic functions, therefore, we hypothesize that CRH is a strong candidate gene for marbling and subcutaneous fat depth (SFD) in a Wagyu x Limousin F2 population. Two pairs of primers were designed, one targeting the proximal promoter region and non-coding exon 1 and one amplifying the coding exon 2 of this gene. A total of five single nucleotide polymorphisms were identified, including AAFC02066696.1:g.28202C>T, c.29263G>C, c.29386G>A, c.29438A>C and c.29481G>C. Among these four cSNPs, c.29263G>C, c.29386G>A, and c.29481G>C are missense mutations, leading to amino acid changes from arginine to proline, from serine to asparagine and from aspartic acid to histidine, respectively. All of these five SNPs were genotyped on ~250 F2 progeny, but four were selected as tagging SNPs for association analysis due to no historical recombination observed between c.29263G>C and c.29438A>C. General linear model showed g.28202C>T, c.29263G>C, and c.29481G>C had significant effects on SFD ( $P=0.002 - 0.001$ ), but only c.29481G>C was significantly associated with marbling ( $P=0.022$ ). Our results provide further evidence that CRH is a strong candidate gene for a concordant QTL related to lipid metabolism in mammals.

**Key Words:** CRH, SFD, Marbling

**10 Genetic parameter estimates for ultrasound indicators of carcass performance in Red Angus cattle.** S. E. Speidel<sup>\*1</sup>, R. M. Enns<sup>1</sup>, B. W. Brigham<sup>1</sup>, and L. D. Keenan<sup>2</sup>, <sup>1</sup>Colorado State University, Fort Collins, <sup>2</sup>Red Angus Association of America, Denton, TX.

Inclusion of embryo transfer data in large scale genetic evaluations has been severely limited, mainly due to concerns over the ability to properly account for maternal effects of the foster dam. As an animal ages, the effect of his or her dam on measured traits typically decreases. For traits like ultrasound indicators of carcass performance, usually measured around a year of age, the absence of maternal effects would allow the inclusion of ultrasound observations from embryo transfer animals without the need to adjust for maternal ability of the recipient dam. The objective of this study was to determine whether maternal effects significantly influence ultrasound observations measured on the population of non-embryo transfer Red Angus cattle. Ultrasound data from the Red Angus Association of America, consisting of 26,193 ultrasound observations for traits scan weight (SCWT), ultrasound rib eye area (UREA), ultrasound back fat (UBF), percent intramuscular fat (%IMF) and percent retail product (%RP), were used in the analyses. Each ultrasound trait was first analyzed using a single trait animal model with a random additive genetic effect. A second analysis, evaluated each trait using univariate animal models with random direct and maternal effects. Full and reduced models were compared using likelihood ratio tests. Heritability estimates for the direct additive effect were 0.23, 0.35, 0.30, 0.42 and 0.48 and maternal effect were 0.06, 0.04, 0.03, 0.06 and 0.02 for SCWT, UREA, %IMF, UBF and %RP, respectively. Likelihood ratio tests indicated that the model containing maternal effects fit the data significantly better ( $P < 0.01$ ) in all cases. These results indicate a significant maternal effect on yearling ultrasound observations. Therefore, including data from embryo transfer animals would not be appropriate if the maternal effects of foster dams are unaccounted for.

**Key Words:** Beef Cattle, Ultrasound, Maternal Effects

**11 Nitric oxide and polyamine response to prostaglandin F<sub>2α</sub> in the early and mid-stage ovine corpus luteum.** B. R. Schilling<sup>\*</sup>, K. K. Kane, L. M. Dixon, R.D. Speckmann, and D. E. Hawkins, *New Mexico State University, Las Cruces.*

Nitric oxide (NO) and polyamines (PA) are potential local mediators of corpus luteum (CL) function. The requisite enzymes in the NO and PA biosynthetic pathways are inducible (iNOS) and endothelial (eNOS) nitric oxide synthases and ornithine decarboxylase (ODC), respectively. This study determined mRNA encoding iNOS, eNOS, and ODC, NO concentration and ODC activity in early (d 4; d 0 = estrus; n = 54) and mid (d 10; n = 54) stage ovine CL in response to PGF<sub>2α</sub>. Ovine CL were collected via ovariectomy on d 4 or d 10 at 0, 4, 12 and 24 h following PGF<sub>2α</sub> (10 mg, i.m. at -4 and 0 h) or saline (2 mL, i.m. at -4 and 0 h). Real time RT-PCR was used to quantify relative amounts of mRNA. Message for iNOS, eNOS and ODC were greater ( $P \leq 0.01$ ) in d 4 CL compared to d 10 CL. Relative amounts of mRNA encoding iNOS in response to PGF<sub>2α</sub> were greater ( $P \leq 0.01$ ) in d 4 CL compared to d 10 CL (0.72 vs 0.43 ± 0.06 arbitrary units, respectively). On both d 4 and d 10, PGF<sub>2α</sub> resulted in reduced ( $P \leq 0.01$ ) iNOS mRNA at 0 and 4 h. Messenger RNA encoding eNOS decreased in response to PGF<sub>2α</sub> on d 4 and d 10 beginning at 12 h and continuing through 24 hrs ( $P \leq 0.03$ ). No response was detected to PGF<sub>2α</sub> on d 4 or d 10 in relative amounts of mRNA encoding ODC ( $P$

$\geq 0.05$ ). Day 4 CL responded to PGF<sub>2α</sub> with increased ( $P \leq 0.05$ ) NO from 0 to 4 h (11.1 vs 21.8 ± 3.6 nmol•g<sup>-1</sup>) after injection, which then returned to baseline. Day 4 CL had greater ( $P \leq 0.01$ ) ODC activity than d 10 CL (44.3 vs 4.8 ± 4.1 counts•min<sup>-1</sup>•g<sup>-1</sup>). No differences were observed among d 10 CL in ODC activity ( $P \geq 0.61$ ). Day 4 CL responded to PGF<sub>2α</sub> with increased ( $P \leq 0.01$ ) ODC activity from 4 to 12 h (17.7 vs 58.8 ± 11.7 counts•min<sup>-1</sup>•g<sup>-1</sup>), and this increase was sustained through 24 h (69.1 ± 10.9 counts•min<sup>-1</sup>•g<sup>-1</sup>). These results indicate both mRNA and corresponding enzyme activity or product fluctuate during the ovine luteal phase and in response to PGF<sub>2α</sub>.

**Key Words:** Nitric Oxide, Polyamines, Corpus Luteum

**12 Expression and distribution of urea transporter-B in lambs fed increasing dietary protein.** R. M. Stohrer<sup>\*</sup>, K. J. Austin, R. L. Atkinson, E. L. Belden, and P. A. Ludden, *University of Wyoming, Laramie.*

Level of dietary CP may affect the expression and distribution of urea transporter-B (UT-B) in tissues important to N recycling in ruminants. Fifteen Dorset wether lambs (initial BW = 45.8 ± 1.3 kg) were blocked by initial BW and assigned to one of three treatments within a randomized complete block design. Lambs were fed a basal diet of mature crested wheatgrass hay (4.2% CP, 59% NDF) for ad libitum consumption plus one of three soybean meal-based supplements to achieve concentrations of 6, 9, or 12% dietary CP. Lambs were randomly euthanized within block on d 28 and samples (5 g) taken from the gastrointestinal tract, liver, kidney, and parotid salivary gland were snap frozen and later processed for Western blot analyses for UT-B. Immunoblotting using a rabbit polyclonal antibody to UT-B confirmed the presence of distinct 32 kDa (consistent with a non-glycosylated UT-B protein) and 47 kDa (probable N-glycosylated form of UT-B) protein bands in all nine tissues. A broad 32 kDa band and a slight 47 kDa band were detected in samples from the liver, reticulum, dorsal rumen, and ventral rumen. The cecum, large colon, spiral colon, and parotid salivary gland displayed a slight 32 kDa band and a visible band at 47 kDa. The kidney displayed slight bands at both 32 kDa and 47 kDa. No treatment differences in the abundance (arbitrary densitometry units) of the 32 kDa ( $P \geq 0.15$ ) or 47 kDa ( $P \geq 0.51$ ) UT-B bands or in the 32 kDa/47 kDa ratio ( $P \geq 0.38$ ) were detected within tissues. However, the 32 kDa/47 kDa ratio differed ( $P = 0.05$ ) across tissues, being greatest for the ventral rumen (92.5), liver (79.7), and reticulum (27.7), intermediate for the dorsal rumen (8.0), and lowest for the kidney (1.8), large colon (0.8), spiral colon (0.8), cecum (0.6), and parotid salivary gland (0.2). Although dietary CP level had no effect on expression of either form of UT-B, differences in the 32 kDa/47 kDa ratio among tissues may suggest a possible role of N-glycosylation in the regulation of UT-B function.

**Key Words:** Urea Transporters, Nitrogen Recycling, Lambs

**13 Effect of duration of CIDR treatment on conception and pregnancy rates in beef heifers using a timed-AI protocol.** D. Gunn<sup>\*1</sup>, J. B. Glaze, Jr.<sup>2</sup>, A. Ahmadzadeh<sup>3</sup>, D. Falk<sup>3</sup>, and R. Findlay<sup>4</sup>, <sup>1</sup>University of Idaho Extension, Fort Hall, <sup>2</sup>University of Idaho, Twin Falls, <sup>3</sup>University of Idaho, Moscow, <sup>4</sup>University of Idaho Extension, Pocatello.

The objective of this experiment was to determine the effect of reducing the length of CIDR exposure in a timed-AI synchronization protocol (CIDR-PGF2?-GnRH and AI) on conception and pregnancy rates in beef heifers. British cross-bred heifers (n = 82) were stratified by body weight (BW) and body condition score (BCS) and were randomly subjected to one of the following two treatments: 1) heifers (n = 41) received CIDR (d -7) for 7 days, PGF<sub>2α</sub> (25 mg) at CIDR removal (d 0), GnRH (75 μg) 56 h after CIDR removal and immediate AI (d 3; 7-d CPG); or 2) heifers (n = 70) received CIDR (d -5) for 5 days, PGF<sub>2α</sub> (25 mg) at CIDR removal (d 0), GnRH (75 μg) 56 h after CIDR removal and immediate AI (d 3; 5-d CPG). Signs of behavioral estrus were monitored four times daily two days before CIDR insertion and three days following CIDR removal. Blood samples were collected from all heifers on the day of CIDR insertion (d 7 in 7-d CPG and d 5 in 5-d CPG) and at breeding (d 3). Heifers were exposed to bulls fourteen days after AI. Pregnancy status was determined via transrectal ultrasonography at d 32 and 82 after AI. Data were analyzed by logistic regression. Percentage of heifers detected in estrus was not different between groups (71% and 66% for 7-d CPG and 5-d CPG, respectively). Based on serum progesterone results, the synchronization rates were similar between groups. Treatment had an effect (P < 0.03) on conception to AI (39% and 65.8 %) for 7-d CPG and 5-d CPG, respectively. Age tended to effect conception to AI (P = 0.07), whereas BW and BCS did not effect conception to AI. Overall pregnancy rate was not different between treatment groups (95.1%). Body weight had a marginal effect on pregnancy rate (P = 0.07), whereas age and BCS did not have an effect on pregnancy rate. Results from this study indicate that reducing the length of CIDR treatment (5 days vs. 7 days) in a CIDR-based timed-AI synchronization protocol may improve conception to AI in beef heifers.

**Key Words:** Beef Heifers, CIDR, Timed-AI

**14 Selection intensities, generation intervals, and population structure of Red Angus cattle.** G. C. Márquez\* and D. J. Garrick, *Colorado State University, Fort Collins.*

Livestock industries have a nucleus-multiplier-commercial structure, with nucleus herds dictating the rate and direction of genetic change. The nucleus typically represents a small fraction of the total population but these animals dominate the pedigrees, particularly on the sire pathways. The objectives of this study were to quantify pathways of selection (sires to produce sires, SS; sires to produce dams, SD; dams to produce sires, DS; dams to produce dams, DD) in terms of selection intensities and generation intervals, and use this information to characterize parental origins within and across herds. Pedigree and breeder records from 1955 to 2006 were obtained from the Red Angus Association of America. Birth records were traced forwards to identify bull (or heifer) calves that contributed to SS/SD (or DS/DD) paths. Proportions of animals that became grandparents in each birth year were computed to determine selection intensities. The age of grandparents when sons (or daughters) became sires (or dams) was calculated. In each herd, grandparents were coded as having been bred in that herd or an outside herd based on available breeder identification. The percentage of herds that produced animals in each pathway was determined. Average selection intensities based on selected proportions

were 2.07, 1.71, 0.96, and 1.83 s.d.; generation intervals were 4.5, 5.0, 4.4, and 4.9 years for SS, DS, SD, and DD respectively, from 1955 to 1999. Selection intensities increased over the first 30 years then declined over the next decade. This resulted from a preference for younger animals reflected in reductions in generation intervals for all paths during the same time. Theoretical genetic gain assuming a correlation between predicted and actual merit of 0.5 had a maximum value of some 0.2 genetic s.d. per year from 1975 onwards, up from 0.1 genetic s.d. More than 50% of animals in all paths were bred in outside herds. Some two thirds herds produced progeny in the maternal path, while less than half produced paternal animals. Results support the division of pedigree herds into nucleus and multiplier categories.

**Key Words:** Selection Intensity, Generation Interval, Red Angus

**15 The ability of a yeast-derived cell wall preparation to minimize toxic effects of high-alkaloid tall fescue straw in beef cattle.** M. L. Merrill\*<sup>1</sup>, D. W. Bohnert<sup>1</sup>, D. L. Harmon<sup>2</sup>, A. M. Craig<sup>3</sup>, and F. N. Schrick<sup>4</sup>, <sup>1</sup>Oregon State University, Burns, <sup>2</sup>University of Kentucky, Lexington, <sup>3</sup>Oregon State University, Corvallis, <sup>4</sup>University of Tennessee, Knoxville.

Two experiments were conducted to evaluate the influence of a yeast-derived cell wall preparation (YCW) on forage intake and digestibility, ruminal fermentation characteristics, serum prolactin and prolactin stores, and milk production in beef cattle consuming high-alkaloid tall fescue straw. In Exp. 1, 16 ruminally cannulated steers (200 ± 6 kg BW) were blocked by BW and within block assigned to one of four treatments (TRT) containing YCW at 0, 20, 40, or 60 g•hd<sup>-1</sup>•d<sup>-1</sup>. Tall fescue straw (579 ppb ergovaline) was provided at 120% the previous 5-d average intake with soybean meal (SBM) used as a CP supplement. In the 29-d digestion study, total DMI and DM digestibility were not different (P > 0.05). A linear decrease in ruminal liquid dilution rate (P = 0.03) was noted as YCW increased. Weekly serum prolactin was not affected by TRT (P > 0.05); however, prolactin stores linearly increased as YCW increased (P = 0.05). In Exp. 2, 60 cows (517 ± 5 kg BW; approximately 200 d gestation) were stratified by BCS and randomly assigned to the same four YCW treatments as Exp. 1 (447 ppb ergovaline high-alkaloid straw) with the addition of a low-alkaloid straw (149 ppb ergovaline; no YCW supplementation) as a positive control (CON). Cows were provided ad libitum access to straw and were supplemented with SBM daily. One cow was removed from the 40 g•hd<sup>-1</sup>•d<sup>-1</sup> TRT due to clinical signs of fescue toxicosis. The CON cows gained more weight (P = 0.02) pre-calving compared to 0 g•hd<sup>-1</sup>•d<sup>-1</sup> cows. A linear increase (P = 0.04) in milk production was observed as YCW increased at 60 d post-partum. Serum prolactin post-calving and change from initial to post-calving increased linearly (P = 0.02 and P = 0.05, respectively) with increasing YCW supplementation. Also, post-calving serum prolactin was higher (P = 0.002) in CON compared to 0 g•hd<sup>-1</sup>•d<sup>-1</sup> cows. The YCW seems to alleviate some symptoms of the fescue toxicosis and, therefore, has the potential to be used successfully with other management practices when feeding or grazing high-alkaloid tall fescue.

**Key Words:** Ergot Alkaloid, Ergovaline, Prolactin

## Breeding and Genetics

**16 Estimation of heterotic effects on heifer pregnancy in crossbred beef cattle.** C. M. McAllister<sup>\*1</sup>, D. D. Kress<sup>1</sup>, K. C. Davis<sup>1</sup>, D. C. Anderson<sup>1,2</sup>, R. M. Enns<sup>3</sup>, D. L. Boss<sup>2</sup>, and J. M. Rumph<sup>1</sup>, <sup>1</sup>Montana State University, Bozeman, <sup>2</sup>Montana State University, Havre, <sup>3</sup>Colorado State University, Fort Collins.

Reproduction is the most important factor in profitability of the cow herd when compared with other economically important traits, such as growth and carcass characteristics. By increasing the proportion of heifers calving at two yr of age, producers can increase the revenue and selection intensity of their herds. Therefore, the primary objective of this project was to estimate breed effects and heterosis values for heifer pregnancy. Reproductive records collected on 684 purebred and crossbred commercial beef females, comprised of Hereford, Simmental, and Tarentaise, from Montana State University's Northern Agricultural Research Center in Havre, Montana were analyzed as a binary trait. Females were born from 1976 to 1995. Data included calving records on two- and three-yr-old cows. Heifer Pregnancy was defined as a success if her first calving record was at two yr of age, but a failure if her first calving record was at three yr of age. Heifer pregnancy was able to be defined this way because young cows in this herd were not culled unless they were open for two consecutive years. Comparison of direct genetic effects showed that Simmental females were the most likely and Hereford females were the least likely to calve at two yr of age with Tarentaise being intermediate to the other two breeds. Comparison of maternal genetic effects showed that females out of Simmental dams were the most likely and females out of Tarentaise dams were the least likely to calve at two yr of age with Herefords being intermediate to the other two breeds. Heterosis was estimated to be -2.49% and -1.62% for direct and maternal heterosis, respectively, which is a favorable response that indicates that crossbreeding will increase the proportion of females calving at two yr of age.

**Key Words:** Heterosis, Heifer Pregnancy, Reproduction

**17 Genetic analysis of rebreeding to produce a calf at three years of age in the Montana Line 4 Hereford herd.** J. M. Rumph<sup>\*1</sup>, D. D. Kress<sup>1</sup>, K. C. Davis<sup>1</sup>, D. C. Anderson<sup>1,2</sup>, and D. L. Boss<sup>2</sup>, <sup>1</sup>Montana State University, Bozeman, <sup>2</sup>Montana State University, Havre.

Rebreeding a first calf heifer to produce her second calf at 3 yr of age can be challenging for beef producers. Heifers generally require more recovery time following their first calf which may delay the onset of estrus to a point beyond the normal breeding season. In an effort to improve heifer rebreeding, data on beef cows at 2 and 3 yr of age were analyzed to determine if rebreeding of first calf heifers is under any degree of genetic control. Records on 419 females born from 1976 - 2004 were analyzed to determine genetic parameters for probability of rebreeding. Animals included in the analysis were the Line 4 Herefords which are maintained at Montana State University's Northern Agricultural Research Center in Havre, Montana. Young cows in this herd were only culled if they were open, so any cow calving at 2 yr of age, but not at 3 yr of age was considered to fail at rebreeding. Overall, 67% of females were successful in breeding back to produce a calf at 3 yr of age. To estimate the genetic parameters associated with this trait, data were analyzed using MTDFREML with year of birth as a

categorical fixed effect and percentage of individual inbreeding fit as a linear and quadratic covariate. On the observed scale, heritability was estimated to be 0.14 (0.12). Converting the observed trait to the underlying scale produced a heritability estimate for rebreeding of 0.24. Probability of rebreeding to produce a second calf at three yr of age has a genetic component and selection against females who fail to rebreed should result in a positive genetic response.

**Key Words:** Genetic Parameters, Reproduction, Beef Cattle

**18 Retrospective analysis of selection applied to a ratio.** M. D. MacNeil<sup>\*</sup>, *USDA Agricultural Research Service, Miles City, MT.*

Use of ratios to adjust one correlated trait for another is fairly commonplace. However, there are statistical arguments that restrict the appropriate use of ratios to certain circumstances. The ratio of a calf's weaning weight to that of its dam has been used as an indicator of cow efficiency and an evaluation criterion. Objectives of this study were to retrospectively assess selection applied when bulls were selected based on the ratio of their weaning weight to the coincident weight of their dam and predict correlated responses in these weights to that selection. The variance of the ratio tended to increase ( $P = 0.11$ ) as weaning weight increased, but was independent of cow weight. The observed selection differential for weaning weight was independent of the selection differential for the ratio ( $P > 0.10$ ). However, the selection differential for cow weight was inversely related to the selection differential for the ratio ( $P = 0.01$ ). The emphasis on cow weight relative to that given weaning weight ranged from 3% to 109% ( $SD = 31\%$ ) and the variance of the index in retrospect fluctuated more than 5-fold. It follows that the correlated responses of weaning weight and cow weight to selection for their ratio would be variable. These results contraindicate use of the ratio of calf weaning weight to cow weight either as an evaluation criterion for beef cows or as a selection criterion upon which to choose bulls or heifers. By inference, the use of ratios of traits to evaluate animals or as selection criteria is generally likely to be inappropriate.

**19 Iterative solution of linear equations from national beef cattle evaluation.** D. J. Garrick<sup>\*</sup>, B. W. Bringham, and S. E. Speidel, *Colorado State University, Fort Collins.*

Genetic evaluation comprises setting up and solving equations including fixed (herd, year, age-of-dam) and random (direct, maternal) effects. Animal models that include effects for every animal in the pedigree are typically used. Resulting equations are large (millions of animals times several traits) and sparse (less than 100 non-zero elements per equation). Evaluations undertaken by the Center for Genetic Evaluation of Livestock at CSU utilize a sequential method of solving known as Gauss-Seidel (G) iteration, as implemented in the Animal Breeders Tool Kit. No relaxation is used, nor is account taken of equation structure. In multi-trait circumstances, Block (B) Gauss-Seidel may be used, whereby a few equations (eg all effects on one animal) are solved simultaneously. This technique was superior in sire-maternal grandsire models but has less advantage in animal models when blocks may be sparse, as in models assuming zero direct-maternal genetic covariance. An alternative approach providing

iterative refinement is conjugate gradient (C) and is typically superior when equations can be preconditioned using the diagonal (D) or suitable B. There is little difference in arithmetic operations required, although C methods can process equations without regard to the order of the elements, whereas G requires coefficients sorted by row and column. The objective of this study was to quantify these methods for convergence rate. Datasets representing 79690 (24735 blocks of size 3), 193660 (45901×4), 421074 (137043×3) equations from growth or carcass evaluations were iterated at least 5000 rounds. Methods were compared after each round by computing the correlation (within factors) of current round to final converged values. Correlations exceeding 0.999 for all factors using G, BG, DC, BC required 558, 558, 54 and 54 rounds in dataset 1, >2000, >2000, 203 and 150 rounds in dataset 2, >2000, >2000, 271 and 187 in dataset 3. Conjugate gradient methods required about one-tenth iterations of Gauss-Seidel. There was little or no advantage in accounting for blocks in these datasets.

**Key Words:** Mixed Model Equations, Iterative Solution, Pre-Conditioned Conjugate Gradient

**20 Urotensin 2 and its receptor as potential candidate genes for beef marbling score and subcutaneous fat depth.** D. J. Tobey, T. F. Daniels, J. J. Michal, and Z. Jiang\*, *Washington State University, Pullman.*

Urotensin 2 (UTS2) and its receptor (UTS2R) are associated with insulin resistance in humans, and many studies have indicated that intramyocellular lipid (IMCL) accumulation is a major contributor to insulin resistance. In beef cattle, marbling is a subjective measurement of IMCL accumulation. Therefore, the objective of this study was to validate the candidacy of both UTS2 and UTS2R for fat deposition in beef cattle. Both cDNA and genomic DNA sequences of these two genes in cattle were retrieved from public databases and used to design 11 pairs of primers. Direct sequencing of the amplicons identified 5 SNPs in UTS2 and one INDEL and 13 coding SNPs in UTS2R, respectively. However, only one SNP in the promoter of UTS2 and the INDEL in the promoter of UTS2R were chosen for genotyping on ~ 250 Wagyu · Limousin F2 population. Statistical analysis revealed that the former gene was suggestively associated with subcutaneous fat depth (SFD) ( $P < 0.10$ ), but not with beef marbling score (BMS), while the latter gene was significantly associated with BMS ( $P < 0.01$ ), but not with SFD. Our results provide evidence that the same orthologous gene may have conserved functions in biological or biochemical pathways, and thus explain the same or similar variations of the concordant QTLs among different species. Therefore, cross-species candidate gene transfer is worth pursuing to facilitate understanding of genetic complexity of quantitative traits in mammals.

**Key Words:** Beef Cattle, Candidate Genes, Association

**21 Ultrasound estimates of loin muscle measures and backfat thickness augment live animal prediction of weights of subprimal cuts in sheep.** T. D. Leeds\*<sup>1</sup>, M. R. Mousel<sup>1</sup>, D. R. Notter<sup>2</sup>, and G. S. Lewis<sup>1</sup>, <sup>1</sup>*USDA-ARS, U. S. Sheep Experiment Station, Dubois, ID,* <sup>2</sup>*Virginia Polytechnic Institute and State University, Blacksburg.*

The efficacy of live animal, real-time, B-mode ultrasound (US) estimates of carcass traits as (partial) predictors of carcass composition

warrants investigation in sheep of varying genetic and environmental backgrounds. Our objectives were to 1) evaluate US estimates of corresponding carcass measures using correlations ( $r$ ) and statistics established for beef and swine (prediction SE [SEP]; repeatability SE [SER]; and bias [TB]); and 2) estimate variation in weights of subprimal cuts (roast-ready rack, trimmed loin, and boneless leg), after accounting for live BW, explained with US loin muscle and backfat (BF) measures. Wethers ( $n = 172$ ) from four sire breeds were reared in an extensive system, finished on a concentrate diet, and harvested at a mean weight of 62.9 (SD = 9.5) kg. Before harvest, 12<sup>th</sup>/13<sup>th</sup> rib transverse US images were captured using an ALOKA SSD-500V US device with a 3.5-MHz, 14.5-cm linear array transducer and standoff. Images were interpreted using ImageJ software (v1.36b). After a 24-h chill, carcasses were ribbed, measured for loin muscle area (LMA) and BF, and fabricated. Weights of subprimal cuts were described using linear models with BW and US loin muscle and BF measures as predictors. Prediction models that maximized  $R^2$  and included only significant terms ( $P < 0.05$ ) were identified. For Objective 1, SEP, SER, and TB for BF were 0.14, 0.08, and 0.07 cm, respectively, and  $r$  was 0.81. The SEP, SER, and TB for LMA were 1.55, 1.31, and -0.004 cm<sup>2</sup>, respectively, and  $r$  was 0.75. For Objective 2, the best prediction models for trimmed loin and boneless leg weights included BW and US LMA and BF as predictors. The best prediction model for roast-ready rack weight included BW and US LMA. The BW explained 70.3, 69.9, and 72.9% of variation in trimmed loin, boneless leg, and roast-ready rack weights, respectively; US estimates explained an additional 4.1, 5.6, and 2.3% of variation in these weights. Based on these data, US estimates of carcass measures obtained by a trained technician can be reliable and can augment our ability to predict weights of subprimal cuts in live sheep.

**Key Words:** Sheep, Ultrasound, Carcass

**22 Identification of factors affecting Angus bull sale prices.** K. L. Shirley\* and D. J. Garrick, *Colorado State University, Fort Collins.*

Individual bull sale prices were predicted for an Angus producer from information commonly available to customers using regression on historical information. Data included EPD, 112-d performance test results, BW and 365-d ultrasound data for 375 bulls from 2004 to 2006. Three models were developed: a breeder perception model based on explanatory variables identified using a customer survey, a best fit model which used EPD, phenotypes, sire and maternal grandsire (MGS), and a practical model which did not include sire or MGS. The breeder perception model included EPD for birth weight, weaning weight, yearling weight, rib-eye area, intramuscular fat, and scrotal circumference, and phenotypic measures for test ADG and test weight per day of age. The best fit model was developed using regression selection methods of PROC REG in SAS and included EPD for fat, scrotal circumference, birth weight, rib-eye area, milk, and weaning weight, phenotypic measures of actual birth weight, frame score, test ADG, and end test BW, the American Angus Association beef value index, sire and MGS. The practical model included all variables from the best fit model except for sire and MGS. The breeder perception, best fit, and practical models accounted for 56%, 81%, and 67% of the variation in sale price which corresponded to SD of \$657, \$563, and \$584, respectively. Sire and MGS were significant ( $P = 0.01$ ) factors affecting sale price and accounted for 47% of the variation when used alone. Correlation coefficients between actual and predicted sale prices

were 0.77, 0.90 and 0.83 ( $P = 0.01$ ) using the breeder perception, best fit and practical models, respectively. Variables customers identified as affecting bull sale prices were similar to those identified using statistical methods except fat and milk EPD, American Angus Association beef value index, and phenotypic measures of actual birth weight and frame

score were identified as additional determinants of sale price. Sire and MGS appeared to be important factors affecting individual sale prices. However, the uncertainty of which sires will be in demand the following year suggested the practical model was the most useful.

**Key Words:** Angus, Sale Price Prediction, Sire Preference

## Extension Symposium

### **23 The extension service and the beef industry: Yesterday vs. today.** J. A. Paterson\*, *Montana State University, Bozeman.*

In 1914, the Smith-Lever Act mandated a partnership between agricultural colleges and the USDA to provide for cooperative agricultural extension programs. Agricultural extension work was originally developed to provide applications of research through practical demonstrations. While research, is often very specific and narrow in scope, extension is often broader in scope with regard to problem solving. Traditionally, university animal scientists have had many of the same common goals as the beef industry. However, producers sometimes have had the perception that academic arrogance, discipline myopia, uncoordinated research, slow technology transfer, increasing research costs, and counter-productive tenure systems prevent animal scientists from being as responsive as they could be. Extension programs must be available to all, but survival will depend on being both highly useful and well marketed. To illustrate this, a recent study from FL showed that the top three sources of information for beef producers were 1) other producers, 2) county agents, 3) veterinarians. The types of information delivery preferred were 1) extension newsletters, 2) cattle magazines, and 3) extension bulletins. The value of extension is demonstrated by a rancher who said his worst ranch decisions were based on tradition, anecdotal information and the seat of his saddle while the best decisions were based on sound business principles, research-based information and principles of integrated research management. Producers have supported the university through legislative actions. While these traditional funding sources have become stagnant or declined, the response has been to seek out gifts, grants, and user fees to supplement traditional funding and to develop additional partnerships. These sources of monies increased 64.4% from 1990 to 1996. Keeping the beef industry from consolidating by preserving old land-grant approaches is illogical. For example, does every state need a specialist in every discipline? Extension has and does make scholarship in the land-grant universities better and more relevant than it would otherwise be because it solves real problems.

**Key Words:** Extension, Beef Industry, Funding

### **24 Assessing the industry's needs: A production practices survey of cow-calf producers in northeastern Oregon.** C. Parsons\*, *Oregon State University, Baker County Cooperative Extension Service, Baker City.*

Upon arriving in Baker County as the new Agriculture Extension Agent for Oregon State University in the fall of 2005 I mailed out a cow-calf production survey to livestock producers in Baker and Union Counties. This 27 question survey was modified from an earlier 22 question survey that Dr. Dave Bohnert et al. utilized in

2004. Objectives of this survey were 1) to better understand current cow-calf production practices and 2) to enhance Extension Livestock educational efforts in Northeastern Oregon. A total of 415 surveys were mailed out to livestock producers in Northeastern Oregon. A total of 103 surveys were returned and are included in this evaluation (Baker=72; Union=31). Ninety-two percent of the respondents stated they were a commercial cow/calf operation. Herd sizes varied widely with 14, 24, 26, 22, and 14% of respondents listing 0-50, 51-200, 200-400, 400-1000, and greater than 1000 head respectfully. Fifty-eight percent of respondents always cull open cows. Of the 42% (43 respondents) that do not cull all open cows, the top 3 reasons for keeping an open cow were young or proven (16%), production history (8%), and if the cow lost her calf through no fault of her own (6%). The most frequent culling rate for cows was 10-15% (53%), while 55% of survey respondents reported annual mature cow death loss to be less 0.5%, with 0.5-1% accounting for 34% of producers. Seventy-six percent of producers raised their own replacement heifers, with 63% rating their heifer development program as excellent and 37% stating their needs improvement. When asked to describe their heifer replacement rate, 57% of respondents stated they replace a constant percent every year, with 18% stating they replace at the same rate as they cull, only keeping enough to maintain cow numbers. The most common annual cow cost was \$251-\$300 (27%), with \$301-\$350 and \$201-\$250 accounting for 29 and 20% respectfully. Results of this survey will be utilized to better understand current cow-calf production practices, and to assist in addressing and developing future Extension educational efforts in Northeastern Oregon.

**Key Words:** Cow-Calf, Production Survey, Northeastern Oregon

### **25 The future of information dissemination to the beef cattle industry.** T. Field\*, R. Lemenager, B. Long, H. Gardiner, and H. Sutte, *Colorado State University, Fort Collins.*

Agriculture and the lives of people who make their living on the land are embedded in visceral experiences — a world of place, consequences, tough decisions, ever-present change, and always uncertainty. But change is not unique to farms and ranches. The forces of change brought on by technological innovation, market forces, public policy decisions, and the whims of politicians and consumers are also significantly impacting those who serve agriculture. The very infrastructure that stimulated the explosion of agricultural productivity by U.S. farmers and ranchers is undergoing substantial retooling, restructuring and in some cases — dismantlement. In February of 2005, our team was drafted to evaluate the future of the information system for the beef industry. Our mission was not to provide a solution but rather to scout the landscape. We have endeavored to that end. The heart of our report is that the traditional information infrastructure is in crisis. The front lines are manned by talented and highly motivated

professionals. However, our current institutions responsible for information discovery and delivery are struggling. Our belief is that the status quo is incapable of delivering desirable outcomes and that

significant, if not radical, improvement must be initiated to avoid losing our role as a world leader in the beef industry.

## Ruminant Nutrition

**26 Effect of peas on ruminal fermentation, digestibility, and nitrogen losses in dairy cows.** M. Vander Pol\*, A. N. Hristov, S. Zaman, C. Schneider, and N. Delano, *University of Idaho, Moscow.*

A replicated 3 × 3 Latin square design experiment with ruminally cannulated lactating dairy cows was conducted to investigate the effect of partial substitution of soybean meal and corn grain with feed peas on ruminal fermentation, digestibility, and urinary N losses. Treatments were: (1) control diet (% on DM basis): alfalfa hay, 28.0; corn silage, 17.7; whole cottonseed, 7.0; dry distillers grains, 6.0; rolled barley grain, 12.0; solvent-extracted soybean meal (SSBM), 7.4; steam-rolled corn, 19.8; and mineral/vitamin supplement, 2.1; (2) rolled peas diet (RP) – 15% (DM basis) dry rolled peas replacing 45% of the corn grain and 78% of the SSBM; and (3) ground peas diet (GP) – as RP, but peas were coarsely ground through a hammer mill. Digestibility and urinary excretion data were analyzed by analysis of variance Latin square. Ruminal fermentation data were analyzed as repeated measures. Diet had no effect ( $P = 0.213$  to  $0.881$ ) on ruminal pH and total and individual VFA. Acetate to propionate ratio was increased ( $P = 0.001$ ) with the pea diets. Ruminal ammonia concentration was greater ( $P = 0.009$ ) for the pea diets compared with the control (6.1, 7.3, and 7.0 mmol/L, control, GP, and RP, respectively). Total tract apparent digestibility of DM, OM, NDF, N, and starch were not different ( $P > 0.05$ ) between the control and GP diets. The RP diet had lower ( $P = 0.036$  to  $0.005$ ) total tract digestibility of DM, OM, N, and starch than the control and GP. Peas had greater ( $P = 0.001$ ) N solubility *in situ* than SSBM (32 vs. 16%, respectively). Urinary N losses, as proportion of N intake, were greater ( $P < 0.05$ ) for GP than the control and RP. In conclusion, these data suggest that pea protein is more soluble in the rumen than SSBM protein and inclusion of 15% peas in the diet of dairy cows resulted in elevated ruminal ammonia concentration and urinary N losses. Peas have to be coarsely ground for dairy cow diets to avoid depression in total tract digestibility of nutrients.

**Key Words:** Pea, Dairy Cow, Digestibility

**27 Influence of slice baling alfalfa hay on digestive function of steers consuming a feedlot finishing diet.** F. Loya-Olguin<sup>1</sup>, A. M. Encinias<sup>1</sup>, D. A. Walker<sup>1</sup>, N. A. Elam<sup>1</sup>, L. Avendaño-Reyes<sup>2</sup>, and S. A. Soto-Navarro<sup>3</sup>, <sup>1</sup>New Mexico State University, Clayton, <sup>2</sup>Instituto de Ciencia Agrícolas, Universidad Autónoma de Baja California, Mexicali, Baja California, México, <sup>3</sup>New Mexico State University, Las Cruces.

A modification of the traditional alfalfa hay baling system has been developed. The system is referred to as slice baling and consists of slice chopping the hay after suncuring and before baling. This method chops the length of alfalfa stems to 7.6 cm. Slicing is proposed to cause less damage to leaves compared to grinding after baling. Leaves should be more consistent and less leaf material potentially is lost with slice baling. Four ruminally cannulated mixed-breed steers were used in a 4 × 4 Latin square design to evaluate effects of slice baled alfalfa

hay in feedlot finishing diets on digestive function. Treatments were arranged in a 2 × 2 factorial. Factors were baling method (traditional or slice baling) and forage level (8 or 14%). Total tract digestibilities were estimated from intake and total fecal output. Total fecal output was collected and measure using fecal bags. There were no baling method effects ( $P = 0.16$  to  $0.96$ ) on DM, OM, CP, or NDF intakes or DM, OM, and NDF digestibility. Neutral detergent fiber intake and OM digestibility were greater ( $P \leq 0.08$ ) for 14 than for 8% forage. A baling method × forage level interaction ( $P = 0.01$ ) was detected for CP digestibility. At 8% forage, CP digestibility was greater ( $P = 0.03$ ) for slice than traditional alfalfa (75.6 vs.  $72.6 \pm 2.0$ , respectively). However, at 14% forage, CP digestibility was similar ( $P = 0.23$ ) for the 2 baling methods. Rumen volume and turnover time were greater ( $P \leq 0.07$ ) for slice than traditional baled alfalfa, but, fluid and particle passage rates were greater ( $P \leq 0.07$ ) for traditional than slice alfalfa. Ruminal pH was not altered ( $P = 0.72$ ) by baling method ( $5.49$  and  $5.44 \pm 0.08$ , for traditional and slice baling, respectively). Ruminal molar proportion of acetate was greater ( $P = 0.03$ ) for 14 than for 8% forage. The magnitude of ruminal function changes, due to slice bale feeding, were not great enough to expect improved digestive function.

**Key Words:** Feedlot Cattle, Forage, Slice Alfalfa

**28 Long-chain fatty acid flow to the duodenum of cattle fed limited amounts of forage plus supplementary ruminally undegradable protein containing fishmeal.** B. W. Hess<sup>1</sup>, E. J. Scholljegerdes<sup>2</sup>, C. M. Murrieta<sup>1</sup>, and D. C. Rule<sup>1</sup>, <sup>1</sup>University of Wyoming, Laramie, <sup>2</sup>USDA-ARS, Mandan, ND.

Twelve Angus crossbred cattle (8 heifers and 4 steers; average initial BW =  $594 \pm 44.4$  kg) fitted with ruminal and duodenal cannulas and fed restricted amounts of forage plus a ruminally undegradable protein (RUP) supplement were used in a triplicated 4 × 4 Latin square design experiment to determine intestinal supply of long-chain fatty acids. Cattle were fed 4 different levels of chopped (2.54 cm) bromegrass hay (11.4% CP, 57% NDF; OM basis): 30, 55, 80, or 105% of the forage intake required for maintenance. Cattle fed below maintenance were given specified quantities of a RUP supplement (6.8% porcine blood meal, 24.5% hydrolyzed feather meal, and 68.7% menhaden fishmeal; DM basis) designed to provide duodenal essential AA flow equal to that of cattle fed forage at 105% of maintenance. Experimental periods lasted 21 d (17 d of adaptation and 4 d of sampling). Although fatty acid intake from hay increased linearly ( $P < 0.001$ ) as cattle consumed more forage, total fatty acid intake increased (cubic,  $P < 0.001$ ) as total OM intake decreased because fatty acid consumption increased (cubic,  $P < 0.001$ ) as cattle consumed more supplement. As a result, total fatty acid flow to the duodenum increased linearly ( $P < 0.001$ ) as intake of supplement increased. Duodenal flow of 14:1, 15:0, 15:1, 16:0, and 18:0 increased linearly ( $P < 0.05$ ) with increased supplement consumption. A quadratic response ( $P < 0.05$ ) was noted for duodenal flow of myristic, oleic, linoleic, and linolenic acids largely because duodenal flow of these fatty acids was least for cattle consuming

forage at 105% of maintenance. The biohydrogenation intermediates 16:1*c*+11, 18:1*t*11, 18:1*t*10, 18:1*t*12, and 18:1*t*13 responded to dietary treatment in a quadratic fashion ( $P < 0.09$ ), but duodenal flow of CLA was not affected ( $P \geq 0.149$ ) by dietary treatment. We conclude that a supplement consisting of 6.8% porcine blood meal, 24.5% hydrolyzed feather meal, and 68.7% menhaden fishmeal (DM basis) can be fed to maintain or improve intestinal supply of fatty acids in cattle consuming limited amounts of forage.

**Key Words:** Beef Cattle, Supplementation, Fatty Acids

### 29 *In vitro* ruminal protein degradability of barley varieties.

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The objective of this study was to investigate the variability of *in vitro* ruminal protein degradability among barley varieties grown in Idaho. Two hundred forty seven barley samples from 12 locations (2004 cropping season) were analyzed for chemical composition and ruminal protein degradability utilizing an *in vitro* procedure, in which inhibitors were used to prevent microbial uptake of ammonia and amino acids released during breakdown of sample proteins. Barley samples included malting, feed, and two- and six-row varieties. Samples were ground through a 1-mm sieve and analyzed for CP and *in vitro* protein degradability (in triplicate). Data were analyzed using the MEANS and GLM procedures of SAS. Concentration of CP in the samples averaged 10.4±0.06 (min = 6.9% and max = 15.7%). Rate of ruminal protein degradability varied from 3.4 - 4.6%/h (Millennium, Idagold, Nebula, B5057) to 7.6 - 8.4%/h (Excel, Burton, CEB0149, WA10701-49 and WA8501-97) and was not significantly different among barley varieties ( $P = 0.501$ ). Estimated ruminal escape of barley protein varied from 43 - 46% (Excel, Burton, CEB0149, WA10701-49 and WA8501-97) to 58 - 60% (Millennium, Idagold, Nebula, B5057) and was also not different among varieties ( $P = 0.101$ ). The interaction between location and variety was investigated for a sub-group of samples including 12 barley varieties grown at 6 locations. Location and variety had no effect on rate of ruminal degradability ( $P = 0.450$  and 0.574, respectively), or ruminal escape of barley protein ( $P = 0.701$  and 0.118, respectively), but there was a significant interaction between the main effects ( $P = 0.003$  and 0.009, respectively). Results from this study suggest that, depending on environmental factors, some barley varieties may have decreased protein degradability in the rumen.

**Key Words:** Barley, Protein, Ruminal Degradability

### 30 Identification of quality characteristics of feed barley and relating those characteristics to digestibility in feedlot steers.

T. E. Fife, J. I. Szasz, A. N. Hristov, and C. W. Hunt<sup>\*</sup>, University of Idaho, Moscow.

The objective of this study was to evaluate the variability of barley quality and improve the understanding of the relationship between variability in chemical composition and digestibility of barley. In 2004, 249 barley samples were obtained representing different varieties from 13 locations in Idaho. Whole barley was analyzed for bulk density (BD). Representative subsamples were ground through a 1-mm screen and analyzed for DM, NDF, ADF, ash, and starch. The ranges of NDF,

ADF, starch, BD, and *in vitro* true digestibility (IVTD) were 11.8 to 25.6%, 2.2 to 8.8%, 48.2 to 72.5%, 569 to 784 g/L, and 66.7 to 85.1%, respectively. *In vitro* true digestibility was most closely correlated with NDF ( $r = -0.69$ ,  $P < 0.001$ ). Eight sources of barley were then selected to represent a spectrum of BD, IVTD, and chemical composition. Thirty-two steers were adapted to a ration of 80% dry-rolled barley (DM basis). Steers were randomly assigned to the barley sources and digestibility measurements were conducted in 3 periods to provide at least 10 digestibility observations per barley source. Barley sources were different for the chemical components, BD, and IVTD ( $P < 0.001$ ). Dry matter, OM, and starch digestibilities were not different between barley sources ( $P > 0.05$ ). Bulk density was correlated with CP and was quadratically affected by starch content ( $r = -0.82$ ;  $R^2 = 0.50$ , respectively,  $P < 0.001$ ). *In vitro* true digestibility from *in vivo* trial had a quadratic relationship with CP, starch, NDF, and BD ( $R^2 = -0.50$ , 0.61, -0.70, and 0.58, respectively;  $P < 0.001$ ). *In vivo* OM digestibility and ADF content were correlated ( $r = 0.56$ ,  $P < 0.005$ ). However, IVTD was not related to DM, OM, or starch digestibility ( $P > 0.05$ ). Bulk density was not correlated with *in vivo* digestibilities ( $P > 0.05$ ). Results of this study support the notion that 1) there is a wide range in the chemical components of barley sources and 2) fiber appears to be the most reliable predictor of barley digestibility.

**Key Words:** Barley, Digestible Energy, Variability

### 31 Characterization of forage trace mineral concentration by season in diets of beef cows grazing native range in eastern Colorado.

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Concentrations of Se, Cu, Co, Fe, Mn, Mo, and Zn in diets of cows grazing native sandhills range in Eastern Colorado were characterized during a 21-month period in 2001 and 2002. After rumen evacuation and short-term grazing (approximately 30 min.), rumen grab-samples were collected from 2 fistulated beef cows. Samples were collected 27 times (once or twice monthly) and represented four seasons during each yr: winter (Nov. to Mar.), spring (April to May), summer (June to Aug.), and fall (Sept. to Oct.). Samples ( $n = 54$ ) were analyzed for trace mineral concentration. In most (> 90%) samples, Co and Mo concentrations could not be quantified because they were below detection limits (0.5 and 1.0 mg/kg DM, respectively). Overall mean ( $\pm$  SD) concentrations (mg/kg DM) were: Se, 0.26  $\pm$  0.097; Cu, 3.9  $\pm$  1.84; Fe, 428.1  $\pm$  530.06; Mn, 67.7  $\pm$  25.05; and Zn, 18.3  $\pm$  6.43. There was a tendency ( $P = 0.10$ ) for a yr x season interaction for Mn concentration, but no yr x season interaction ( $P > 0.48$ ) for Se concentration, so data were pooled across yr for Mn and Se. Concentration of Se tended to be greater in spring vs. summer ( $P = 0.11$ ) and fall ( $P = 0.06$ ), and Mn concentration tended ( $P = 0.09$ ) to be greater in winter than spring. There were yr x season interactions for Cu ( $P < 0.01$ ), Fe ( $P < 0.05$ ), and Zn ( $P < 0.001$ ) concentrations. In Yr 1, Cu concentration was greater ( $P < 0.05$ ) in winter vs. summer and fall, and tended ( $P < 0.09$ ) to be lower in fall vs. spring and summer. In Yr 2, Cu concentration was lower ( $P < 0.05$ ) in winter vs. all other seasons. Concentration of Fe in Yr 1 was greater ( $P < 0.05$ ) in winter than all other seasons. Winter Zn concentration in Yr 1 tended ( $P = 0.08$ ) to be greater than spring, and was greater ( $P < 0.05$ ) vs. summer and fall. Concentration of Zn was lower ( $P < 0.05$ ) in winter vs. all other seasons in Yr 2, and greater ( $P < 0.05$ ) in fall compared to all other seasons. Results suggest that beef cow diets in parts of

eastern Colorado contain inadequate Cu and Zn concentrations, and concentrations of some trace minerals may differ by season.

**Key Words:** Beef Cows, Native Range, Trace Minerals

**32 Influence of supplemental whole flaxseed level on forage intake and site and extent of digestion in beef heifers consuming native grass hay.** E. Scholljegerdes\* and S. Kronberg, *Northern Great Plains Research Laboratory, USDA-ARS, Mandan, ND.*

The objectives of this study were to evaluate the influence of supplemental whole flaxseed level on intake and site and extent of digestion in beef cattle consuming native grass hay. Nine Angus heifers (avg. BW 303 ± 6.7 kg) fitted with ruminal and duodenal cannulas were used in a triplicated 3 × 3 Latin square. Cattle were fed ad libitum chopped native grass hay (8.7% CP and 70.0% NDF, DM basis). All animals were randomly allotted to one of three experimental treatments being either no supplement (Control); 0.91 kg whole flaxseed; or 1.82 kg whole flaxseed on a DM basis. Supplemental flaxseed tended to decrease (linear,  $P = 0.06$ ) forage OM intake. However, total OM intake did not differ ( $P = 0.29$ ) due to flaxseed inclusion. Total duodenal OM flow increased (linear,  $P = 0.05$ ) with additional flaxseed in the diet and no differences were observed for microbial ( $P = 0.29$ ) OM flow. True ruminal OM disappearance was not affected ( $P = 0.14$ ) by supplemental flaxseed. Apparent lower tract OM digestibility was greater for supplemented versus Control cattle ( $P = 0.03$ ) and increased (linear,  $P = 0.01$ ) with level of whole flaxseed. Apparent total tract OM digestibility was not different ( $P = 0.41$ ) among treatments. Nitrogen intake increased ( $P < 0.001$ ) with supplemental flaxseed. Total duodenal N flow tended ( $P = 0.08$ ) to increase with additional dietary flaxseed. Therefore, true ruminal N digested (g/d) tended ( $P = 0.07$ ) to be greater for flax fed cattle, however, true ruminal N digestibility did not differ ( $P = 0.11$ ) across treatment. Supplemental whole flaxseed did not influence ruminal ( $P = 0.13$ ) or total tract ( $P = 0.14$ ) NDF digestibility. An increase in the duodenal supply of 18:3n-3 ( $P < 0.001$ ), total unsaturated fatty acids ( $P < 0.001$ ) and total fatty acids ( $P < 0.001$ ) was observed with additional dietary whole flaxseed. Overall, the inclusion of 1.82 kg of flaxseed does not appear to negatively influence nutrient digestibility of a forage-based diet and therefore can be used as an effective supplement to increase intestinal supply of key fatty acids important to human health.

**Key Words:** Digestion, Flaxseed, Forage

**33 Backgrounding calves with annual forage crops.** A. L. Todd\*<sup>1</sup>, L. M. M. Surber<sup>1</sup>, S. D. Cash<sup>1</sup>, M. M. Stamm<sup>2</sup>, C. S. Schauer<sup>2</sup>, M. M. Thompson<sup>1</sup>, and A. Hafila<sup>1</sup>, <sup>1</sup>Montana State University, Bozeman, <sup>2</sup>North Dakota State University, Hettinger.

Cereal forages harvested as hay have become popular winter forage for livestock producers in Montana. This may be explained in part by use of cereal forages as an emergency crop in times of drought. Study objectives were to evaluate animal performance of newly released winter cereal crops in comparison to barley hays. In 2005, 'Willow Creek' winter wheat (WW) hay and Willow Creek WW silage were compared to 'Hays' and 'Haybet' barley hays. Eighty Angus cross steers were allotted to 16 pens in a randomized complete block design. Steers were given ad libitum access to their cereal forage source, 3.96 kg · head<sup>-1</sup> · d<sup>-1</sup> of cracked feed barley, and 0.45 kg · head<sup>-1</sup> · d<sup>-1</sup> of a

commercial 32% CP supplement. Pen (rep = 4) was the experimental unit in a 66 d trial. Steers were weighed and diet, ort, and fecal samples were obtained on d 34 and upon completion (d 66) of the trial. Diet and fecal samples were composited by pen and analyzed for DM, OM, N, NDF, ADF, and IADF. Insoluble acid detergent fiber was used to estimate fecal output. Steers fed Haybet and Hays diets had higher ADG than steers fed WW silage and WW hay (1.29, 1.28, 1.08, and 1.15 kg · head<sup>-1</sup> · d<sup>-1</sup>, respectively,  $P < 0.01$ ). Dry matter intake was greatest ( $P < 0.01$ ) for steers fed WW silage, intermediate for Hays and WW hay and lowest for steers fed Haybet (avg. 15.5 vs. avg. 8.9 kg · head<sup>-1</sup> · d<sup>-1</sup>). Gain:feed ratio was highest ( $P < 0.01$ ) for Haybet, intermediate for Hays and WW hay and lowest for WW silage (15.7 vs. avg. 11.2 kg gain/100 kg feed). No difference was seen in DM, N, or ADF digestibility ( $P > 0.10$ ). While the barley hay based diets resulted in higher ADG and intake, WW hay and silage would still have acceptable animal performance for backgrounding rations.

**Key Words:** Backgrounding, Cereal Forages, Winter Wheat

**34 Effects of bacterial endotoxin and dietary protein on serum hormones and plasma amino acids in growing steers.** J. W. Waggoner\*, C. A. Loest, J. L. Turner, C. P. Mathis, K. K. Kane, L. Chen, D. M. Hallford, and M. K. Petersen, *New Mexico State University, Las Cruces.*

Bacterial lipopolysaccharide (LPS) mimics clinical and metabolic responses to gram(-) bacterial infection in cattle. Effects of LPS and dietary protein on serum prolactin (PRL), triiodothyronine (T3), thyroxine (T4), insulin, insulin-like growth factor-1 (IGF-1) and plasma AA were evaluated in 24 steers (250 ± 2.8 kg BW). Treatments were a 2 × 3 factorial arrangement of LPS (0 vs 1.5 µg/kg BW; -LPS vs +LPS) and diets containing (DM basis): 1) 14.5% CP, 11.6% ruminally degradable protein (RDP) and 2.9% ruminally undegradable protein (RUP; CP14.5CON); 2) 16% CP, 13.3% RDP and 2.7% RUP (CP16RDP); and 3) 16% CP, 11.3% RDP and 4.7% RUP (CP16RUP). Casein was used to alter dietary RDP, and fish meal and corn gluten meal were used to alter dietary RUP. Steers were adapted to diets (1.2 Mcal/kg NEg fed DM at 1.8% BW) for 14 d, and steers were infused (i.v. 1 mL/min) with LPS (in 100 mL saline) on d 15. Blood samples were collected before LPS infusion and every 2 h for 12 h thereafter. No LPS × diet × hour interactions ( $P > 0.23$ ) were observed. Serum PRL in +LPS steers was elevated from 2 to 4 h after LPS infusion, and insulin increased 4 h after LPS infusion. Both PRL and insulin of +LPS steers returned to pre-LPS concentrations and were similar to -LPS steers by 6 h after infusion (LPS × hour,  $P \leq 0.05$ ). Serum IGF-1, T3, and T4 decreased in +LPS steers 2 h after infusion and remained lower than -LPS steers for 12 h (LPS × hour,  $P \leq 0.05$ ). Plasma Met, Ile, and Thr of +LPS steers decreased at 2 h, and plasma Leu and Trp decreased at 4 h after LPS infusion. These AA remained lower in +LPS than -LPS steers for 12 h (LPS × hour,  $P \leq 0.05$ ). Plasma Phe was lower ( $P \leq 0.05$ ) for +LPS than -LPS steers at 4 through 6 h after infusion. Concentrations of Leu were greater ( $P \leq 0.05$ ) for steers fed CP16RUP than CP14.5CON and CP16RDP. Results imply that altering concentration or source of dietary protein does not affect serum hormones, but serum hormones and essential AA are altered in steers exposed to bacterial endotoxin.

**Key Words:** Stress, Protein, Cattle

**35 Impacts of supplemental glucogenic precursors and cow age on postpartum range cow performance.** R. L. Endecott<sup>1</sup>, S. H. Cox<sup>2</sup>, and M. K. Petersen<sup>2</sup>, <sup>1</sup>Montana State University, Bozeman, <sup>2</sup>New Mexico State University, Las Cruces.

Altering nutrient partitioning after calving from milk production to positive energy balance may improve reproductive performance. A 2004 study conducted at the Corona Range and Livestock Research Center evaluated responses of 2- (n = 17), 3- (n = 23), and 4-yr-old (n = 31) postpartum cows grazing native range (11.3% CP and 80% NDF, OM basis) to 3 protein supplements with increasing glucogenic potential (GP). Supplements were fed at 1,135 g•cow<sup>-1</sup>•d<sup>-1</sup> twice weekly for 65 d postpartum and provided: 1) 341 g CP, 142 g ruminally undegradable protein (RUP), 57 g GP (RUP0), 2) 341 g CP, 151 g RUP + 80 g propionate salt (NutroCAL™, Kemin Industries, Inc.), 121 g GP (RUP80), or 3) 341 g CP, 159 g RUP + 160 g propionate salt, 185 g GP (RUP160). A supplement · age interaction occurred for days to first estrus ( $P = 0.10$ ). Days to first estrus were longest for 2-yr-old cows fed RUP0 and then decreased with cow age ( $P \leq 0.04$ ),

while for RUP80 and RUP160, return to estrus was similar for 2- and 3-yr-old cows ( $P \geq 0.16$ ) and shorter for 4-yr-old cows ( $P \leq 0.10$ ). Milk production exhibited a quadratic ( $P = 0.03$ ) response to increasing supplemental GP, with cows fed RUP80 producing the least amount of milk at 55 d postpartum (9,982, 8,439, and 9,620 ± 473 g/d for RUP0, RUP80, and RUP160, respectively). Milk production differences did not impact 205-d calf weight ( $P = 0.96$ ; 251 ± 5 kg). Days from BW nadir to estrus decreased linearly with cow age ( $P < 0.01$ ; 33, 22, and 1 ± 4 d for 2-, 3-, and 4-yr-old cows, respectively). Milk production increased linearly with cow age ( $P < 0.01$ ; 7,856, 9,407, and 10,777 ± 509 g/d for 2-, 3-, and 4-yr-old cows respectively). Calf 205-d weight reflected cow age differences in milk production (linear  $P < 0.01$ ; 229, 249, and 274 ± 6 kg for 2-, 3-, and 4-yr-old cows, respectively). Moderate amounts of supplemental GP shifted nutrients away from milk production. Older cows returned to estrus at the same time they reached BW nadir, while younger cows needed to regain weight to return to estrus. Glucogenic precursor addition to protein supplements decreased days to first estrus in postpartum 2-year-old range cows.

**Key Words:** Beef Cattle, Glucogenic, Reproduction

## POSTER PRESENTATIONS

### Behavior

**36 Effects of mild stress on ewe maternal behavior.** G. Leedy and B. Alexander\*, *University of Wyoming, Laramie.*

Maternal behavior is important for the survival of offspring. It was hypothesized that mild recurrent stress diminishes maternal behavior and this effect is reversed by administration of the antidepressant sertraline. Commercial western white-faced ewes (n=12) were exposed to short duration stress three times per wk beginning on d four postpartum (PP). Stress included social isolation and presence of a barking dog. Control ewes (n=6) were not exposed to direct stress. Response to stress was quantified by changes in serum concentrations of cortisol. Beginning on d eight PP, ewe behavior was observed for 5 min following lamb removal and 5 min following reunion of ewe and lamb. During lamb absence, number of high-pitched bleats and time spent pacing were used as measures of agitation. Upon reunion, a maternal score was computed based on number of times the ewe nuzzled her lamb, number of low pitched grunts, and amount of time lambs were allowed to nurse. Beginning on d 21 PP, six stressed ewes were treated daily with 200 mg sertraline and behavior testing continued for four wks. Data analysis indicates that stress acutely increased ( $P < 0.05$ ) concentrations of cortisol, but did not chronically affect ( $P > 0.05$ ) cortisol secretion. Prior to d 21 PP, stress decreased ( $P < 0.05$ ) maternal behavior and agitation during separation. After d 21, maternal behavior did not differ ( $P > 0.05$ ) across groups. Stressed untreated ewes continued to show decreased ( $P < 0.05$ ) agitation compared to control ewes, while sertraline-treated ewes were not different ( $P > 0.05$ ) from either control or stressed-untreated ewes. By wk four PP, stress no longer elicited an increase in cortisol from ewes not receiving sertraline; however, concentrations of cortisol were acutely elevated in sertraline-treated ewes. These data indicate that mild stress early in the PP period decreases maternal behavior and agitation due to lamb removal. Sertraline treatment partially reverses this effect,

but is associated with increased cortisol secretion in response to stress. This is similar to the increased agitation seen in humans during early antidepressant treatment.

**Key Words:** Ewe, Postpartum, Maternal

**37 Effects of progesterone on ram reproductive behavior.** K. J. Austin, J. T. Raines, and B. M. Alexander\*, *University of Wyoming, Laramie.*

Progesterone is necessary in males for spermiogenesis and testosterone biosynthesis. The current study tested the hypothesis that progesterone is also a crucial modulator of sexual behavior in rams. Intact Columbia rams (n = 6) and Columbia rams gonadectomized (GNX; n = 5) at 6 – 7 mo of age were exposed to ewes in estrus at 10 – 11 mo of age. Expressed reproductive behaviors were recorded and categorized as investigatory (investigatory sniffs, flehmen, foreleg kicks, nudge, vocalization) or consumatory (mount attempts, mounts, ejaculations) behaviors. Following determination of baseline behaviors, intact rams were treated with the specific progesterone receptor antagonist, mifepristone (RU486; 25 mg), twice daily, and re-tested. Gonadectomized rams were implanted subcutaneously with 4 doses of Synovex-h (200 mg testosterone and 20 mg estradiol per dose). Expression of reproductive behavior was determined one month following insertion of Synovex-h implants. Pursuant to behavior testing, GNX rams were treated with 5 mg of progesterone twice daily and behavior was monitored. Two intact rams with low serum concentrations of testosterone and an absence of sexual behaviors were removed from the study. Mifepristone treatment did not affect ( $P = 0.3$ ) the expression of investigatory behaviors in intact rams, but tended ( $P = 0.09$ ) to

decrease the expression of consumatory behaviors. Testosterone and estradiol (Synovex-h) alone tended ( $P = 0.07$ ) to increase the number of investigatory behaviors in GNX males, but consumatory behavior was not observed. Investigatory behaviors tended ( $P = 0.09$ ) to be further increased following treatment of GNX males with progesterone. Mounts and mount attempts were observed in two of the five GNX males following progesterone treatment, but consumatory behavior was

not increased ( $P = 0.25$ ) overall. Concentrations of serum testosterone did not differ among intact and GNX males treated with Synovex-h. Progesterone appears to facilitate the expression of ram reproductive behavior and may be especially important for the expression of consumatory behavior.

**Key Words:** Progesterone, Ram, Behavior

## Breeding and Genetics

**38 Characterization of Brahman, Brangus, Charolais, Gelbvieh and Simmental for growth traits in Baja California, Mexico.** A. P. Marquez<sup>\*1</sup>, J. S. Saucedo<sup>1</sup>, M. Montaño<sup>1</sup>, V. Armendariz<sup>1</sup>, and J. N. Guerrero<sup>2</sup>, <sup>1</sup>Universidad Autonoma de Baja California, Mexicali, Baja California, Mexico, <sup>2</sup>University of California, Agricultural and Natural Resources, Holtville, CA.

The objectives were to estimate genetic parameters of heritability for birth weight BW, weaning weight WW, and yearling weight YW, in a herd located, in Ojos Negros, Baja California, México. It was used the progeny ( $n=21$ ,  $n=30$ ,  $n=33$ ,  $n=28$ , and  $n=32$ ) of heifers and cows of inheritance Brahman B, Brangus Br, Charolais C, Gelbvieh G, and Simmental S, mated to sires B, Br, C, G, and S, respectively. Each trait was analyzed separately by using mixed models, SAS, (1996). The analytical model included: year of birth, age of cow, sex of the calf, birth date as a covariable to adjust a common age as fixed effects; sire and the residual as random components. The BW, WW, and YW values ( $34.67 \pm 1.06$ ,  $37.82 \pm 2.51$ ,  $41.50 \pm 2.51$ ,  $44.42 \pm 1.0$ , and,  $39.83 \pm 5.1$ ;  $174.80 \pm 8.52$ ,  $206.96 \pm 29.30$ ,  $216.29 \pm 18.65$ ,  $225.29 \pm 17.87$ , and  $266 \pm 8.92$ ;  $239.97 \pm 40.88$ ,  $261.98 \pm 20.24$ ,  $268.30 \pm 9.57$ ,  $298.50 \pm 40.16$ , and  $308.19 \pm 29.75$  kg) corresponded to the progeny of dams involving inheritance of B, Br, C, G, and S, mated to sires involving inheritance of B, Br, C, G, and S respectively. Female calves were 5 to 7% heavier at birth than female calves. The estimates values of heritability, through the correlation among paternal half sibs were ( $h^2=0.31 \pm 0.04$ ,  $h^2=0.21 \pm 0.05$ , and  $h^2=0.33 \pm 0.03$ ) for BW, WW, and YW, respectively.

**Key Words:** Genetic Parameters, Weights at Birth and Weaning, Yearling Weight

**39 Effect of ram breed on pre-weaning growth performance of crossbred lambs.** S. P. Doyle<sup>\*</sup>, C. R. Johnson, G. A. Darling, and W. R. Patton, California State University, Chico.

The objective of this study was to determine the effects of ram breed on the pre-weaning performance of crossbred lambs. Silverdale (Suffolk · Texel) ewes were allocated to one of three ram breeding groups (Silverdale ram; Blackface ram, Suffolk-Hampshire breeding; or White Dorper ram). Ewes were bred in October and lambed late February and into March. Lambs were weighed at birth and then again every 30 d leading to weaning at 90 d. Birth data were analyzed using ANCOVA (Statistix8, 2003) as a 3X2X3 factorial (3 ram breeds, 2 genders, 3 birth types – single, twins, triplets), fitting dam age as a covariate and blocking on year. Age-adjusted weaning data were analyzed similarly, but birth type was replaced with number of lambs reared by dam (single, twins, triplets). There was a significant interaction between ram breed and gender in the birth weight analysis; furthermore, there was

a significant interaction between ram breed and the number of siblings reared by the ewe. Silverdale-sired (4.7 kg) and White Dorper-sired (4.7 kg) ram lambs were significantly lighter at birth compared to Blackface-sired (5.3 kg) ram lambs ( $p<0.05$ ). Within ewe lambs born, Silverdales (5.0 kg) were heavier than White Dorpers (4.5 kg;  $p<0.05$ ); however, Blackface (4.6 kg) were not significantly different from either Silverdale or White Dorper at birth. At weaning, Blackface-sired and White Dorper-sired lambs raised as singles were significantly heavier at 90 d compared to all other lambs raised as twins and triplets with the exception of Silverdale triplet raised lambs ( $p<0.05$ ). Considering multiple births are the desired production scenario, there does not appear to be a sire breed advantage among Silverdale, White Dorper and Blackface rams; thus, one must consider the potential benefits of a lighter birth weight sire breed if an equivalent weaning weight can be achieved relative to a heavier birth weight sire breed at 90 d.

**Key Words:** Sheep, Breeds, Growth

**40 Effect of ram breed and finishing diet on carcass traits of crossbred wether lambs.** S. P. Doyle<sup>\*</sup>, C. R. Johnson, J. W. Holt, and W. R. Patton, California State University, Chico.

The objective of this study was to determine ram breed and finishing diet effects on carcass traits of crossbred wether lambs. Weaned, crossbred lambs approximately 180 d of age were randomly assigned to one of two finishing diets (grain-based or forage-based) across the three ram biological types (Silverdale, a Suffolk-Texel cross; White Dorper; and Blackface, Suffolk-Hampshire breeding). Lambs were harvested at a constant backfat of 0.4 cm as determined by real-time ultrasound (Aloka 500) between the 12th and 13th ribs. A random sample ( $n=54$ ) of wether lambs was taken and processed at the CSU, Chico Agricultural Teaching and Research Center. Carcass measurements included carcass weight (kg), dressing percent (%), loin eye area ( $\text{cm}^2$ ), loin depth (cm), and backfat (cm). Data were analyzed using ANCOVA (Statistix8, 2003) as a 3X2 factorial (3 ram breeds and 2 diets), blocking on year and fitting trial start weight as a covariate. There was no significant interaction between ram breed and diet. Ram breeds were similar in carcass merit for all traits except carcass weight. While dressing percents were similar among the breeds, Blackface-sired lambs produced heavier carcass weights (3.0 kg advantage;  $p<0.05$ ) compared to Silverdale-sired lambs at similar backfats. White Dorper-sired lambs were not significantly different from either breed. Additionally, forage-finished lambs produced carcasses that were lighter (5.7 kg), dressed lower (6.9%), and possessed smaller ( $3.2 \text{ cm}^2$ ), shallower loin eyes (0.5 cm) with less backfat (0.3 cm) compared to grain-finished lambs ( $p<0.05$ ). Blackface-sired lambs appear to have a slight advantage in pounds produced on the rail compared to the other breeds studied. Furthermore,

grain-finishing practices appear to produce a carcass more in-line with industry standards relative to carcass merit.

**Key Words:** Sheep, Breeds, Carcass Conformation

**41 Estimates of genetic parameters for weight in the progeny of Nubian, French Alpine, Saanen, Toggenburgh, and Spanish goats mated to Boer sires.** A. P. Marquez<sup>\*1</sup>, J. S. Saucedo<sup>1</sup>, M. Montañó<sup>1</sup>, and J. N. Guerrero<sup>2</sup>, <sup>1</sup>Universidad Autonoma de Baja California, Mexicali, Baja California, Mexico, <sup>2</sup>University of California, Agricultural and Research Center, Holtville, CA.

Data came from a commercial goat stud at Imperial Valley California. The objectives were to compare the performance of the progeny of goats involving inheritance of Nubian(N), French Alpine (A), Saanen (S) Toggenburgh (T), and Spanish (SP) (n=160), and to estimate genetic parameters for growth traits. Traits analyzed were weight at

birth BWT and weaning WWT, and average daily gain (ADG) from birth to weaning. Separate analysis for each trait used least squares mixed model SAS (1992). The analytical model included: breed of dam, age of dam, sex of the kid, season of parturition as fixed effects; sire, sire x breed of dam interaction and the residual as random components. The overall mean values for weight at birth and weaning were: 1.99 and 12.89 kg respectively. The average values for weight at birth were (2.12 ± 0.07, 2.11 ± 0.06, 2.04 ± 0.05, 1.95 ± 0.06, 2.10 ± .05 and 1.98 ± 0.07, 1.97 ± 0.06, 1.93 ± 0.05, 1.83 ± 0.05, and 1.96 ± .06 kg) for males and females kids, respectively. The average values for weaning weight were (13.99 ± 0.37, 13.29 ± 0.33, 13.25 ± 0.34, 12.67 ± 0.31 and 13.51 ± 0.43, and 12.50 ± 0.29, 12.48 ± 0.30, 11.98 ± 0.29, 12.68 ± 0.41 and 12.60 ± 0.32 kg) for male and female kids, respectively. The estimated ADG from birth to weaning was 0.181 ± 0.32 kg. The average values for daily gain were: 0.187 ± 0.36 and 0.175 ± 0.43 kg for male and female kids, respectively. Estimates of heritability direct values were ( $h^2=0.20 \pm 0.03$ ,  $h^2=0.15 \pm 0.03$  and  $h^2=0.25 \pm 0.05$ ) to BWT, WWT, and ADG, respectively.

**Key Words:** Genetic Parameters, Weight, Boer Goat

## Extension

**42 Teaching cattle producers to manage risk – The Beehive Master Beef Manager Program.** C. K. Chapman\*, D. R. ZoBell, E. B. Godfrey, D. Feuz, C. V. Bagley, R. E. Banner, T. D. Cooper, D. Rothlisberger, R. M. Nelson, and L. K. Greenhalgh, *Utah State University*.

Beef cattle producers face many different types of risk, though they often accept risk as part of production agriculture. Production risk, however, often carries with it impacts which affect other types of risk exposure. The Beehive Master Beef Manager Program (BMBM) was developed as one way to educate cattle producers about risk, beef quality assurance (BQA) and best management practices (BMP). However, the primary objective of the program is to assist producers to identify perceived risks within their operation, and then teach them principles to aid them as they develop strategies to manage these risks. The BMBM program originally began as a Beef Check-off funded Pilot Project and is now offered in five geographical areas of Utah. The BMBM takes a holistic approach to managing risk. Cattle producers are instructed about the various types of risk using the Right Risk computer simulation software and asked to determine which aspects

of risk have the highest priority. The results are then compiled for each teaching location and priorities for future educational programming established to meet the producer-identified needs. The strength of this program is that the producers establish the educational priorities to meet these needs. The Cow-Calf Management Guide & Cattle Producer's Library serves as the primary resource for the sessions held to date, coupled with supplemental materials. Classes taught have included introduction to risk management, cattle marketing options, heifer selection, understanding Expected Progeny Differences, mineral nutrition, weaning strategies to minimize stress, fall cattle management strategies, herd disease management and making management decisions to manage market, human, institutional and production risk. Self-assessed understanding of topics covered in the class sessions were determined through the use of statistical analysis of pre and post workshop evaluations for each topic in each locale where that topic was taught. Results indicate that significant increases in understanding have occurred for all topics at all locales ( $P<0.01$ ). Funding for the program was provided by Western Center for Risk Management Education.

## Nonruminant Nutrition

**43 Feeding barley beta-glucan enhances immune response in mice.** A. V. Grove\*, C. R. Kaiser, J. A. Wiley, A. G. Harmsen, and J. G. P. Bowman, *Montana State University, Bozeman*.

We conducted 3 research trials using mice to investigate the effects of feeding barley beta-glucans on immune response after infection with influenza virus. In Trials 1 and 2, 75-80 mice were fed diets of high beta-glucan barley (HBG; 7.6% beta-glucan), low beta-glucan barley (LBG; 3.8% beta-glucan), corn (CORN; 0.4% beta-glucan), or a standard mouse chow (STD, Trial 2 only; 0.5% beta-glucan). In Trial 3, 20 mice were fed diets of Geraldine barley (BAR; 3.11%

beta-glucan), Geraldine barley plus purified barley beta-glucan (BBG; 5.3% beta-glucan), corn (CORN; 0.10% beta-glucan) or corn plus purified barley beta-glucan (CBG; 6.1% beta-glucan). After 10 d diet adaptation, mice from each treatment were infected with influenza virus (d 0; 50  $\mu$ L/mouse). Weight, intake, and immune response were measured on d -10, -6, 0, 3, 5, 7, 10, 12 and/or 15. In Trial 1, mice fed HBG had greater ( $P = 0.0001$ ) BW than LBG- and CORN-fed mice on d 5 and 10. In Trial 2, HBG-fed mice had greater ( $P = 0.04$ ) BW than mice fed CORN and STD on d 3. Mouse BW did not differ ( $P = 0.25$ ) between treatments in Trial 3. In Trials 1 and 2, DMI did not differ ( $P \geq 0.11$ ) between diets, averaging 10.0 and 10.2% BW, respectively.

Mice fed HBG had greater ( $P = 0.0001$ ) serum and lung IgG on d 7 and less serum and lung IgG on 10 d compared to mice fed CORN and LBG. Mice fed LBG had greater ( $P = 0.001$ ) lung TNF $\alpha$  than CORN-fed mice on d 5, and mice fed CORN and LBG had less lung TNF $\alpha$  than mice fed HBG on d 7. Lung albumin was greater ( $P = 0.002$ ) in mice fed HBG and CORN than mice fed LBG on d 7, and least for HBG-fed mice, intermediate for LBG-fed mice, and greatest for CORN-fed mice on d 10. Viral recovery was less ( $P = 0.04$ ) in LBG- than CORN- and HBG-fed mice on d 7. On d 10 in Trial 3, mice fed BBG tended ( $P = 0.11$ ) to have greater lung lactate dehydrogenase than mice fed BAR, and mice fed CBG tended ( $P = 0.10$ ) to have greater serum IgA compared to mice fed CORN. An amount of beta-glucan to stimulate the immune system of mice can be provided by feeding barley-based diets.

**Key Words:** Barley, Intake, Mice

**44 Commercial phytases of *Aspergillus niger* in broilers' diets.** S. Godoy\*<sup>1</sup>, C. F. Chicco<sup>1</sup>, G. Hernández<sup>1</sup>, and P. Pizzani<sup>2</sup>, <sup>1</sup>Instituto Nacional de Investigaciones Agrícolas (INIA), Maracay, Aragua, Venezuela, <sup>2</sup>Universidad Rómulo Gallegos, San Juan de los Morros, Guárico, Venezuela.

To evaluate the effect of added commercial phytases (*Aspergillus niger*) to improve phytic phosphorus utilization in broilers fed soy-corn mash basal diet, 480 one day old chicks of the commercial Cobb · Cobb hybrid were used in a factorial arrangement 3x4 with four replications of 10 birds for each treatment. Diets contained four levels of phytases

(0, 300, 400 and 500 U/kg), with increasing total phosphorus (Pt) levels (0.45, 0.55 and 0.65%) by adding a commercial dicalcium phosphate. Diets with 24% crude protein, 3100 Kcal ME/kg and constant level of Ca (1%) were fed ad libitum to birds. Body weight, tibia bone ash and Pt retention were measured at 4 weeks of age. Chicks body weight increased ( $P < 0.05$ ) along with total phosphorus levels, with values of 1173, 1325 and 1379g, respectively. There was a tendency ( $P = 0.09$ ) to greater body weight with phytase additions with values of 1104, 1137, 1232 and 1222 g, respectively. Feed intake was greater ( $P < 0.05$ ) with 0.65% Pt diets, with no differences between lower levels (0.55 and 0.45% Pt), with values of 1865, 1768 and 1514 g, respectively. Phytase additions showed a tendency to increase feed intake at all Pt levels. Feed conversion was better ( $P < 0.05$ ) at 0.45% Pt level (1.29), with no differences between higher Pt levels (1.34 and 1.35). Bone ash content (%) increased ( $P < 0.05$ ) with phosphorus levels, with values of 38.65, 40.83 and 43.00% and with phytase additions, with values of 37.17 and 40.11, 41.87 and 42.26 and, 42.66 and 43.76 respectively for 0 and 500U/kg enzyme levels, for each increase of Pt in the diets. Bone P was 14.18, 16.37 and 17.63% P, respectively for dietary Pt levels. Total P net retention (%) was greater ( $P < 0.05$ ) for 0.65% Pt level, followed by 0.55 and 0.45%, with mean values of 69, 65 and 61, respectively. Total phosphorus excretion decreased with phytase addition, being more evident with 0.65% dietary Pt. It is concluded that phytase supplementation increased body gain and feed intake only at low dietary phosphorus level (0.45%), while the enzyme was more effective on bone mineralization at all phosphorus levels. In addition within each dietary Pt levels, the exogenous phytase increased Pt retention.

**Key Words:** Phytic Phosphorus, Phytase, Broiler

## Ruminant Nutrition

**45 Investigation of the bioavailability of manganese from organic vs. inorganic supplements.** J. Hall<sup>1</sup>, H. Winger<sup>1</sup>, P. Hole\*<sup>1</sup>, and R. Samford<sup>2</sup>, <sup>1</sup>Utah State University, Logan, <sup>2</sup>Albion Advanced Nutrition, Hico, TX.

This study investigated the bioavailability of Mn-Glycine chelate vs. inorganic manganese (Mn) in lactating dairy cattle. Groups of 15 cows each were fed TMR containing mineral supplements with Mn as 1) 100% Mn oxide (0% group), 2) 50% Mn oxide and 50% Mn chelate (50% group), or 3) 100% Mn chelate (100% group) for a formulated total Mn concentration of 70 ppm, in a complete randomized block design. The feeding study lasted 8 wk. Clinical condition, serum Mn, whole blood Mn, liver Mn, and milk Mn were monitored prior to the study, at 4 wk, and at 8 wk. Also, milk production, somatic cell counts, milk protein, and milk fat were tested weekly. No differences were observed in clinical health, somatic cell counts, milk fat, or milk production among the treatments. No differences were observed for serum Mn at 0 and 4 wk, but cows receiving both chelate treatments had significantly greater serum Mn than those in the 0% group at wk 8 ( $P < 0.05$ ). The whole blood Mn of the 100% group was significantly greater than the 0% group at 4 wk, but did not differ from the 50% group ( $P < 0.10$ ). Similarly, the whole blood Mn of the 50% group was significantly greater than the 0% group, but did not differ from the 100% group at 8 wk ( $P < 0.10$ ). No changes in milk Mn contents were observed at wk 4. By wk 8, cows receiving both Mn chelate diets had significantly greater milk Mn than those in the 0% group ( $P < 0.05$ ),

but the two chelate groups did not differ. Liver Mn of both chelate diet groups was significantly greater than the 0% group at wk 4 ( $P < 0.05$ ). The liver Mn of the 50% group was significantly greater than the 0% group, but did not differ from the 100% group at wk 8. Percent milk protein was quite variable across the 8 weekly tests, with the 100% group being lower than the other 2 groups on wk 2, lower than the 50% group on wk 4, and lower than the 0% group on wk 5 ( $P < 0.05$ ). The 50% group had significantly more milk protein content than the other two groups at wk 3 ( $P < 0.05$ ). In summary, the chelated Mn resulted in increased bioavailability as indicated by increased systemic Mn concentrations in various matrices.

**Key Words:** Mn, Chelate, Dairy Cattle

**46 Intake and digestibility of beta-glucan from 'Valier' barley in young calves.** A. V. Grove\*, C. R. Kaiser, N. Iversen, and J. G. P. Bowman, Montana State University, Bozeman.

The mammalian immune system has been stimulated with oral beta-glucan (BG) doses of 0.10 to 0.22 g BG/kg BW; however, BG are highly digestible in the rumen of adult cattle. We conducted 2 research trials to estimate BG intake and digestibility of a 'Valier' barley-based starter pellet by young dairy calves. In Trial 1, diet and fecal samples from five 6- to 9-week old calves (61 kg) fed starter pellets containing

60% ground Valier barley or corn were analyzed for DM, BG, N, ADF, and starch. Data were analyzed using PROC MIXED with treatment, week, and their interaction in the model. Means were separated using LSMEANS when  $P \leq 0.10$ . In Trial 2, three 12-week old calves (108 kg) were individually dosed with sustained release chromic oxide sheep boluses. Digesta samples collected from the beginning and end of small intestine and feces were analyzed for DM, BG, and Cr. In Trial 1, calf ADG did not differ ( $P = 0.61$ ) between treatments, averaging 1.0 kg/d. Intake of DM, N, ADF, and starch by calves did not differ ( $P \geq 0.13$ ) between treatments averaging 1643, 52, 138, 634 g/d, respectively. Beta-glucan intake was greater ( $P = 0.002$ ) by barley- than corn-fed calves (0.63 vs 0.03 g BG/kg BW). Total tract DM and starch digestibility did not differ ( $P \geq 0.11$ ) between treatments averaging 75.6 and 99.0%, respectively. Digestibility of N and ADF was greater ( $P \leq 0.10$ ) in barley than corn-fed calves (68.5 vs 62.2% for N, and 54.1 vs 37.0% for ADF). Beta-glucan digestibility was lower ( $P = 0.09$ ) in corn than barley-fed calves in weeks 8 and 9. In Trial 2, calves consumed 0.94 g BG/kg BW and amounts of BG present at the beginning and end of small intestine and in the feces averaged 0.07, 0.005, and 0.009 g BG/kg BW, respectively. Digestibility to the beginning of the small intestine, from the beginning to end of the small intestine, and for the total tract was 1.9, 81.8, and 69.5%, respectively for DM, and 93.0, 91.9, and 99.0%, respectively for BG. A calf starter pellet containing 60% ground 'Valier' barley delivered an amount of BG to the small intestine of young calves at the low end of oral beta-glucan doses used to stimulate the immune system of other mammals.

**Key Words:** Barley, Beta-Glucan, Calves

**47 Effects of ruminal protein degradability and supplementation frequency on expression and distribution of urea transporter-B in lambs fed low-quality forage.** R. M. Stohrer\*, K. J. Austin, R. L. Atkinson, E. L. Belden, and P. A. Ludden, *University of Wyoming, Laramie*.

Thirteen Dorset wether lambs (initial BW  $34 \pm 4$  kg) were used in a completely randomized designed experiment to examine the effects of ruminal protein degradability and supplementation frequency on the expression and distribution of urea transporter-B (UT-B) in tissues important to N recycling. Lambs were fed crested wheat grass hay (4.2% CP, 59% NDF) for ad libitum consumption plus one of four isonitrogenous supplements: 1) ruminally degradable protein (RDP) to meet estimated daily RDP requirements fed daily ( $n=3$ ), 2) RDP fed on alternate days ( $n=3$ ), 3) ruminally undegradable protein (RUP) fed on alternate days ( $n=3$ ), or 4) a 50:50 mixture of RDP and RUP fed on alternate days ( $n=4$ ). After 18 d, lambs were euthanized and samples (5 g) taken from the gastrointestinal tract, liver, kidney, and parotid salivary gland were snap frozen and later processed for Western blot analyses for UT-B. Immunoblotting using a rabbit polyclonal antibody to UT-B confirmed the presence of distinct 32 kDa (consistent with a non-glycosylated UT-B protein) and 47 kDa (probable *N*-glycosylated form of UT-B) protein bands in all nine tissues. The liver, dorsal rumen, reticulum, and ventral rumen displayed strong bands at 32 kDa and lighter bands at 47 kDa. The spiral colon, cecum, parotid salivary gland, large colon, and kidney had slight bands at 32 kDa and visible bands at 47 kDa. Although the abundance of the 47 kDa UT-B band in the ventral rumen was greater ( $P = 0.03$ ) in lambs fed RDP daily, no other treatment differences ( $P = 0.16$  to  $0.99$ ) in the abundance of the 32 or 47 kDa UT-B proteins or the 32 kDa/47 kDa ratio within tissue

were observed. However, the 32 kDa/47 kDa ratio was greatest ( $P = 0.001$ ) for the liver with no difference ( $P = 0.63$  to  $0.99$ ) among the remaining tissues. Although protein supplementation strategy had little effect on UT-B expression in tissues other than the ventral rumen, differences in *N*-glycosylation among tissues may provide insight into the regulation of UT-B function.

**Key Words:** Lambs, Nitrogen Recycling, Urea Transporters

**48 Feeding value of corn and 'Valier' barley for finishing steers.** N. L. Iversen\*, A. V. Grove, J. G. P. Bowman, D. Boss, and T. K. Blake, *Montana State University, Bozeman*.

Seventy-eight crossbred steers (average initial weight  $436 \pm 3.9$ kg) were used to evaluate the feedlot performance of finishing diets based on corn or 'Valier' barley. Grains were cracked prior to being fed and diets were formulated to be isocaloric (2.04 Mcal/kg NEm and 1.43 Mcal/kg NEg) and isonitrogenous (2.6% N). Diets were formulated to contain 80% grain, 6% straw, 3% soybean oil, and 11% vitamin/mineral supplement. Steers were weighed every 28 d with diet, ort, and fecal samples also collected at these times. Steers were slaughtered when 70% were visually estimated to grade Choice and carcass measurements were collected. Weight and carcass data were analyzed using the GLM procedure of SAS. Means were separated using LSMEANS when  $P < 0.10$ . Average daily gain did not differ ( $P = 0.94$ ) between steers fed finishing diets based on corn and 'Valier', averaging 2.0 kg/d. Backfat was lower ( $P = 0.02$ ) from carcasses of steers fed Valier compared to carcasses from steers fed corn (1.24 vs 1.09 cm). Ribeye area tended to be smaller ( $P = 0.13$ ) from carcasses of steers fed Valier compared to carcasses of steers fed corn (80.26 vs 78.45 cm<sup>2</sup>). All other carcass characteristics did not differ ( $P = 0.27$  to  $P = 1.0$ ) between treatments, averaging 341 kg hot carcass weight, 1.9% KPH, Yield Grade 3, and Choice- Quality Grade. There were few differences in feedlot performance between steers fed finishing diets based on corn or Valier barley.

**Key Words:** Barley, Beef Cattle, Corn

#### 49 WITHDRAWN.

**50 Use of methylglyoxal as a tool in predicting ruminal nitrogen status.** M. B. Horvath\*, S. H. Cox, M. K. Petersen, and S. L. Lodge-Ivey, *New Mexico State University, Las Cruces*.

A three year study was conducted to determine the effects of protein supplementation to cattle grazing dormant winter forage on ruminal production of methylglyoxal (MG). Methylglyoxal is a toxic  $\alpha$ -ketoaldehyde produced by rumen microbes in response to excess glucose and insufficient nitrogen (N), as is often the case when ruminants graze dormant forage. Ruminant microbes produce MG through an alternate shunt of the glycolytic pathway. Six ruminally-cannulated mature cows (average BW =  $638.33 \pm 50$  kg) were assigned to two treatments using a completely random experimental design. Treatments consisted of: 36% CP cottonseed meal supplement fed 3x / week ( $900 \text{ g head}^{-1} \bullet \text{feeding}^{-1}$ ) and no supplement (salt and mineral

only). Dormant pastures grazed were typical of central NM winter forage (yr 1: 8.2% CP, 75.1% NDF; yr 2: 7.0% CP, 65.4% NDF and yr 3: 6.7% CP, 68.3% NDF; DM basis). Rumen fluid was collected every other week from mid-December to mid-February for a total of 5 sampling days and was analyzed for ammonia, pH, and MG. Treatment did not affect ruminal ammonia ( $P = 0.94$ ), pH ( $P = 0.96$ ), or MG ( $P = 0.17$ ). Year (yr) of study influenced ammonia ( $P < 0.04$ ), pH ( $P < 0.01$ ), and MG ( $P < 0.01$ ) concentrations. Ruminal pH values were different ( $P < 0.01$ ) for yrs 1, 2, and 3 (5.89, 6.33, and  $5.59 \pm 0.096$ , respectively). Ruminal ammonia in yr1 was 57.0% higher ( $P < 0.01$ ) than yr2 and 61.7% higher ( $P < 0.01$ ) than yr3. Methylglyoxal was 55.6% higher ( $P < 0.01$ ) in yr2 than yr1 and 48.8% higher ( $P < 0.01$ ) in yr3 compared to yr1. Ruminal MG differed by day ( $P < 0.01$ ) and was lower for collection 1 than 5 (0.87 vs. 2.27;  $P < 0.01$ ). These data indicate that yearly forage quality is important for ruminal bacteria metabolism. In yr 1 carbohydrate and N were better balanced compared to yrs 2 and 3. This was supported by greater MG production in year 1 vs. yrs 2 and 3. Additionally, MG production differed by day which may be indicative of MG being a sensitive indicator of declining forage quality during the grazing season.

**Key Words:** Methylglyoxal, Cattle, Carbon:Nitrogen Ratio

### 51 In situ rates of insoluble macromineral release from alfalfa and tropical grasses and relationships with dry matter disappearance.

K. Buck\*<sup>1</sup>, J. R. Carpenter<sup>1</sup>, M. S. Thorne<sup>1</sup>, and B. W. Mathews<sup>2</sup>, <sup>1</sup>CTAHR, University of Hawaii at Manoa, Honolulu, <sup>2</sup>CAFNR, University of Hawaii, Hilo.

In Hawaii, most of a ruminant's nutrients come from forages, including minerals. Mineral supplements are often expensive and may lead to excess excretion by the animal, impairing economic returns and environmental sustainability. Therefore, one must know the concentration and availability of minerals in forages for accurate ration formulation. The objectives of this research were to determine the concentration and rates of insoluble macrominerals released from tropical forages in the rumen, and their relationship to DM disappearance. Both ground (1 mm) forage and digesta residue samples (0, 12, 24, 48, and 96 h after nylon bag insertion) from previous in situ rumen digestion studies, each with 2 or 3 fistulated steers, were analyzed for macromineral (Ca, Mg, P, K, Na, S) concentration using inductively coupled plasma-emission spectroscopy. Seven tropical grasses and alfalfa harvested from single species plots were evaluated. After 96 h, the proportion of minerals remaining averaged across all grasses (as a percent of insoluble mineral initially present  $\pm$  SE) was  $32.8 \pm 1.69\%$ ,  $67.1 \pm 9.68\%$ ,  $22.9 \pm 1.6\%$ ,  $13.68 \pm 2.8\%$ ,  $79.6 \pm 11.49\%$ , and  $59.3 \pm 3.78\%$  and for alfalfa hay was  $20.6 \pm 3.11\%$ ,  $60.1 \pm 30.08\%$ ,  $23.2 \pm 1.49\%$ ,  $8.4 \pm 3.37\%$ ,  $27.3 \pm 4.45\%$ ,  $19.5 \pm 0.39\%$ , for Ca, Mg, P, K, Na, and S, respectively. Several of the samples had a net recovery of minerals exceeding 100% at 96 h. There was also a significant effect of species on the proportion of Ca, K, and Na ( $p < 0.002$ ), and Mg, P, and S ( $p < 0.0001$ ) remaining after 96 h. This suggests that a given species of forage should be evaluated for extent of mineral release before concluding that it provides sufficient levels of minerals to an animal. Additional research may need to be done to determine how efficiently minerals released in the rumen are absorbed into the bloodstream and the impact of abomasal digestion on mineral release of tropical forages.

**Key Words:** Macromineral, Tropical Forage, Beef Cattle

### 52 Effects of safflower oil and vitamin E on feedlot performance of sheep divergently selected for lambing rate.

A. L. Kelley\*, K. C. Davis, P. G. Hatfield, R. W. Kott, and J. M. Rumph, *Montana State University, Bozeman.*

Sixty-eight Rambouillet ram lambs (average weight of  $32 \text{ kg} \pm 5.94 \text{ kg}$  and average age of  $156 \text{ d} \pm 5 \text{ d}$ ) were used in a  $2 \times 2$  factorial arrangement of treatments to determine the effect of energy source and level of Vitamin E on feedlot performance. Rams were weighed after an 18 h shrink and randomly assigned to one of 12 feedlot pens. Each pen was randomly assigned to 1 of 4 diet treatment combinations in a completely randomized design. Pen was the experimental unit with either 5 or 6 lambs in each pen. Energy treatments were either a 6% oil ration using whole safflower seeds (SS) or a starch based isocaloric and isonitrogenous control (SC) combined with either 400 IU (VE) or 0 IU (VC) of supplemental Vitamin E. All rams started on a 70% roughage, 30% energy concentrate diet. Rams had ad libitum access to water. Salt and mineral were included in both the VE and VC supplements. Diets were pelleted, hand mixed, and placed in self feeders allowing rams ad libitum access to their respective diets. Over an 18 d period, the amount of concentrate in the diets was increased until a finishing diet with 1.79 NEm and 1.16 NEg was achieved. Rams received the finishing diet for 61 d. Rams were weighed at the beginning and end of the trial, as well as when transitioning from the step-up period to the finishing diet. This allowed for the analysis of DMI, ADG, total kg gained, and G:F within the step-up, finishing periods, and for the entire study. No interactions were detected ( $P > 0.10$ ) between the S and V treatments. Step-up, finishing and entire study ADG, gain, and DMI, and step-up and finishing period G:F did not differ ( $P > 0.10$ ) for the main effects of energy source or level of Vitamin E. Entire study G:F was less ( $P < 0.05$ ) for both SS compared to SC and VE compared to VC. Neither safflower oil nor supplemental Vitamin E enhanced feedlot lamb performance.

**Key Words:** Safflower, Sheep, Vitamin E

### 53 Effect of feeding frequency on feedlot steer performance.

J. Schutz, J. Wagner, T. Engle, and E. Sharman\*, *Colorado State University, Fort Collins.*

Two hundred seventy crossbred yearling steers ( $318.37 \pm 7.05 \text{ kg}$  initial BW) were utilized at the Southeastern Colorado Research Center to determine the effect of feeding frequency (once vs. twice vs. three times a d) on performance and carcass characteristics. Steers were used in a previous receiving trial and were re-randomized for this feeding frequency trial upon initiation of the finishing phase. Steers were stratified by BW within previous receiving trial and randomly assigned to pens. Pens were then randomly assigned to one of three treatment groups: once daily feeding, twice daily feeding, or three times a day feeding. Steers were fed a standard high concentrate steamed flaked corn finishing ration for 170 d. Pen served as the experimental unit and cattle were harvested at a constant days on feed. Steers were individually weighed at the initiation and termination of the trial and pen or individual weights were obtained approximately every 42 d. Average daily gain was similar for steers fed once or twice per d. However, ADG ( $P < 0.03$ ) and ADFI ( $P < 0.04$ ) were greater in steers fed three times a d as compared to once or twice daily feeding. Feed efficiency was similar for all 3 treatment groups. Steers fed three times per d had a greater ( $P < 0.01$ ) HCW than steers fed once or twice per d. No differences were detected between the treatment groups for

USDA quality or yield grade. These data indicate similar performance between feeding once or twice a d; however, feeding three times a day increased ADG, ADFI, and HCW.

**Key Words:** Feeding Frequency, Feedlot Management, Performance

**54 Effect of water quality on Holstein calf performance.** D. Domínguez\*<sup>1</sup>, J. Ventura<sup>1</sup>, G. Villalobos<sup>1</sup>, J. Jaimes<sup>2</sup>, J. A. Ortega<sup>1</sup>, and L. Carlos<sup>1</sup>, <sup>1</sup>*Universidad Autónoma de Chihuahua, Chihuahua, Chihuahua, México*, <sup>2</sup>*Universidad Autónoma de Chapingo, Bermejillo, Durango, México*.

Water is an essential nutrient in dairy cattle, but its availability and quality has been drastically affected. The effect of water quality on the pre-weaning performance of Holstein calves was evaluated. Thirty Holstein calves with 40 ±0.94 kg initial average body weight, were randomly assigned at calving time to two experimental groups: Well Water (WW, 6 females and 9 males) drinking water and water utilized to prepare milk replacer came from farm well, and Inverse Osmosis Water (IOW, 7 females and 8 males) where water from well was processed by inverse osmosis. Calves were fed during the first 3 d after calving with colostrum, and a commercial milk replacer (4 L/d), as well as an initial commercial concentrate (ad libitum) from 7 until 56 d of age. Water quality was analyzed monthly; drinking water and DMI were determined daily and individually; dry matter digestibility, crude protein digestibility and digestible protein intake were determined at the end of the experiment; average daily gain and body weight were measured weekly. Drinking water intake, DMI, and animal performance were analyzed by PROC MIXED of SAS. Digestibility data were analyzed using the PROC GLM of SAS. Total dissolved solids and bacteriologic count from water were reduced 93% (1,469 ±75 vs. 107 ±31 ppm) and 98% (1,506 ±1296 vs. 29 ±39 ufc/100 ml), respectively, by IOW. Water intake was not different (3,554 vs. 3,088 ml;  $P>0.5$ ), but DMI was 26% increased (676 vs. 500 g/d;  $P<0.007$ ) in calves of IOW. Dry matter and crude protein digestibility, as well as digestible protein intake were not affected (74.8%, 65.1%, and 0.169 kg, respectively). Daily gain and body weight were improved 22.7% (0.43 vs. 0.33 kg/d;  $P<0.02$ ) and 10% (64.3 vs. 58.6 kg;  $P<0.0006$ ), respectively, in calves of IOW. It was concluded that processing low quality water by inverse osmosis removes most undesirable compounds and improves animal performance during pre-weaning phase.

**Key Words:** Water Quality, Inverse Osmosis, Holstein Calves

**55 Effects of conjugated tannins on forage ensiling and in vitro ruminal fermentation.** R. A. Halalshah\*, H. M. Sullivan, T. T. Ross, and M. K. Petersen, *New Mexico State University, Las Cruces*.

Alfalfa is widely used in rations of dairy cows in the Western United States. Protein in alfalfa is highly degradable in the rumen; in addition alfalfa protein can be degraded via the ensiling process. Condensed tannins have the ability to bind to protein forming a complex that resists ruminal degradation. Pecan shells contain 1% tannins and the internal material contains 26.4%. In 1999, NM and Western Texas produced about 31.7 million kg of in-shell pecan of which 55% was waste, and is a potential feedstuff for ruminants. Information on the effects of condensed tannins from pecan shells on digestibility of protein and amino acids is limited. In this study, pecan shells (PS) and tannic acid (TA) were supplied at 2% PS, 3% PS, 2% TA, and 3% TA (DM) to in vitro fermentation of high quality alfalfa (HQ), low quality alfalfa (LQ), alfalfa silage (AS), soybean meal (SBM), and corn. Also, alfalfa was ensiled with 5% PS, 10% PS, and 3% TA. Samples were incubated for 0, 24, and 48h. Treatments had no effects ( $P>0.05$ ) on pH at end of fermentation. Addition of PS and TA to HQ, LQ, and AS had no effect ( $P>0.05$ ) on ADF digestibility or concentrations of acetate, butyrate, propionate, valerate, total VFA, total isoacids or acetate:propionate ratio of in vitro buffer concentrations. Addition of PS and TA to HQ, LQ, and AS lowered ( $P<0.01$ ) CP of residual forage after incubation, as well as IVDMD ( $P<0.01$ ),  $\text{NH}_4$  ( $P<0.05$ ), isobutyrate ( $P<0.02$ ), isovalerate ( $P<0.02$ ), and lactate ( $P<0.01$ ) concentrations. Addition of PS and TA to SBM and corn lowered  $\text{NH}_4$  concentrations ( $P<0.01$ ), IVDMD ( $P<0.01$ ) and CP ( $P<0.05$ ) of the residual forage, also altered acetate, butyrate, isovalerate, and propionate concentrations ( $P<0.05$ ). Ensiling alfalfa with PS and TA lowered ( $P<0.05$ )  $\text{NH}_4$  concentrations and CP but had no effect ( $P>0.05$ ) on IVDMD of silage and did not change concentrations of total or individual VFA or acetate:propionate. Adding PS and TA altered in vitro fermentations of HQ, LQ, AS, SBM, and corn. Ensiling alfalfa with PS and TA changed the fermentation characteristics of nitrogen fractions of the silage.

**Key Words:** Tannins, Pecan Shell, Ruminal Fermentation

## SYMPOSIA AND ORAL SESSIONS

### Environment and Livestock Management

**56 Prevalence of *Salmonella* and *E. coli* 0157:H7 large herd dairies in southwestern United States and northern Mexico.** C. H. Martinez<sup>1</sup>, T. S. Edrington<sup>2</sup>, J. D. Thomas<sup>1</sup>, T. T. Ross<sup>\*1</sup>, S. Soto-Navarro<sup>1</sup>, R. R. Redden<sup>3</sup>, B. J. Herron<sup>1</sup>, and D. T. Yates<sup>1</sup>, <sup>1</sup>New Mexico State University, Las Cruces, <sup>2</sup>USDA-ARS, College Station, TX, <sup>3</sup>Montana State University, Bozeman.

Dairy cattle can harbor both *Salmonella* and *E. coli* 0157:H7. Salmonellosis has been reported in southwestern U.S. dairies resulting in decreased milk production and mortality. However, cattle can harbor and shed *E. coli* 0157:H7 without experiencing morbidity. A study was conducted to determine the prevalence of *Salmonella* and *E. coli* 0157:H7 in two Southern New Mexico large herd dairies and one Northern Mexico large herd dairy which were in close proximity of the U.S.-Mexico border. Four pens (lactation pens) on each dairy were selected and fecal grab samples were collected from 7-15 cows per pen. Samples were collected in March, May, July, August, September and November. *Salmonella* was cultured using a double enrichment followed by plating on brilliant green agar supplemented with novobiocin. *E. coli* was cultured using an immuno-magnetic separation technique. On all three dairies, the higher ( $P < 0.05$ ) incidence of *Salmonella* was in July, August and September. However, prevalence in November was still greater ( $P < 0.05$ ) than March and May. *Salmonella* prevalence was greater ( $P < 0.05$ ) in the Mexico dairy compared to the combined U.S. dairies during August. Shortly before this collection, record rainfall occurred in the area. Based on interviews with the dairy managers, salmonellosis was not evident during the collection period. The prevalence of *E. coli* 0157:H7 was generally low in all dairies. However, the Mexico dairy had a higher ( $P < 0.05$ ) prevalence of *E. coli* 0157:H7 in March and the U.S. dairies tended ( $P = 0.07$ ) to have higher incidence of *E. coli* 0157:H7 in August. In conclusion, data confirms cattle can harbor and shed both *E. coli* 0157:H7 and *Salmonella* with greatest prevalence occurring in summer months which corresponds with the period of greatest rainfall in the area.

**Key Words:** *Salmonella*, *E. Coli*, Dairy Cattle

**57 Low-input pasture backgrounding system is more profitable through harvest than high-input drylot system.** C. P. Mathis<sup>\*1</sup>, S. H. Cox<sup>1</sup>, M. K. Petersen<sup>1</sup>, C. L. Löest<sup>1</sup>, R. L. Endecott<sup>2</sup>, and M. Encinias<sup>1</sup>, <sup>1</sup>New Mexico State University, Las Cruces, <sup>2</sup>Montana State University, Bozeman.

Calves are commonly backgrounded for  $\geq 45$  d on the ranch of origin; however, few comparisons of on-ranch backgrounding programs exist. This study compared a low-input pasture backgrounding system (PAST) to a high-input drylot system (DLOT) of the same duration each year (42 – 45 d) to evaluate performance and profit during the backgrounding (BACKGRD; weaning to 42 – 45 d) and finishing (FINISH; end BACKGRD to harvest) phases. Over 3 yr, 250 calves (236 kg avg. initial BW; 133 steers and 117 heifers) were randomly assigned to PAST or DLOT treatments during BACKGRD. The DLOT calves were fed a corn/wheat midds-based pelleted ration (restricted max. intake 3.0% BW) plus alfalfa hay (0.68 to 1.13 kg/d), and PAST calves were supplemented with a 32% CP range cube (0.57 kg/d; 3/wk). After BACKGRD, only steers were finished at a commercial feedlot where they were managed as a single group. During BACKGRD, DLOT calves gained more weight ( $P < 0.01$ ) and had a higher final value ( $P = 0.03$ ), but feed and total costs were more than 4-fold higher ( $P < 0.01$ ). Net income during BACKGRD was \$45 greater ( $P < 0.01$ ) for PAST than DLOT. During FINISH, initial BW and value were similar ( $P \geq 0.37$ ) among DLOT and PAST steers. The DLOT steers had lower ADG ( $P < 0.01$ ; 1.27 vs. 1.07 kg/d) through interim weight (74 – 94 days on feed; DOF) than PAST steers, but subsequent ADG was similar ( $P = 0.68$ ). There were no differences ( $P \geq 0.13$ ) in interim BW, DOF, total ADG, carcass characteristics, or proportion of steers treated for sickness. However, DLOT steers had greater death loss ( $P = 0.02$ ; 7.3% vs. 0.0%) and lower feed cost ( $P = 0.04$ ; \$221 vs. \$238/steer). Although the average price received for carcasses sold was not different ( $P = 0.11$ ), PAST steers garnered \$111 more gross income during FINISH than DLOT ( $P < 0.01$ ; \$946 vs. \$833/carcass), and had a net return advantage ( $P < 0.01$ ) of \$103/hd. The low-input PAST backgrounding system was more profitable than the DLOT system during both the backgrounding and finishing phases.

**Key Words:** Backgrounding, Beef Calves, Feedlot

### Growth and Development

**58 Relationship between residual feed intake and meat quality in steer progeny of divergent intramuscular fat EPD Angus bulls.** J. K. Ahola<sup>\*3</sup>, L. T. Campbell<sup>1</sup>, J. I. Szasz<sup>1</sup>, T. A. Skow<sup>1</sup>, C. W. Hunt<sup>1</sup>, J. B. Glaze, Jr.<sup>2</sup>, and R. A. Hill<sup>1</sup>, <sup>1</sup>University of Idaho, Moscow, <sup>2</sup>University of Idaho, Twin Falls, <sup>3</sup>University of Idaho, Caldwell.

The relationship between feed efficiency [residual feed intake (RFI)] and meat quality has not been well characterized in beef cattle selected for varying levels of intramuscular fat. Daily DMI was recorded for 35 steers (initial weight, 305  $\pm$  27.7 kg), which were the progeny of four Angus sires with low, moderate, or high EPDs for percent

intramuscular fat. Steers were fed for an 84-d post-weaning growth period and weighed bi-weekly, followed by a 90-d finishing period prior to harvest. Complete carcass data and strip loins were collected from each carcass. Strip loins were cut into steaks, aged for 14 d, frozen, and later analyzed for palatability by a trained sensory panel. An RFI value was calculated for each steer, and used to classify steers into 3 groups: efficient ( $< -0.5$  SD;  $n = 9$ ; RFI = -0.60 kg/d), marginal ( $\pm 0.5$  SD;  $n = 18$ ; RFI = -0.01 kg/d), and inefficient ( $> 0.5$  SD;  $n = 8$ ; RFI = 0.65 kg/d). There were no differences among RFI group means for ADG, initial or final body weight, fat thickness, yield grade, ribeye area, percent lipid, hot carcass weight or cooking loss. Inefficient

steers had greater DMI than marginal ( $P < 0.05$ ) and efficient ( $P < 0.01$ ) steers, and marginal steers tended ( $P = 0.07$ ) to have greater DMI than efficient steers. Feed conversion ratio (FCR) was greater ( $P < 0.01$ ) for inefficient vs. marginal and efficient steers. There was a correlation between RFI and DMI ( $r = 0.61$ ;  $P < 0.001$ ), FCR ( $r = 0.64$ ;  $P < 0.001$ ), marbling ( $r = 0.45$ ;  $P < 0.01$ ), quality grade ( $r = 0.40$ ;  $P < 0.05$ ), juiciness ( $r = 0.48$ ;  $P < 0.01$ ), flavor ( $r = 0.47$ ;  $P < 0.01$ ), and Warner-Bratzler shear force ( $r = -0.33$ ;  $P = 0.05$ ). However, RFI was not correlated with ADG,

yield grade, ribeye area, hot carcass weight, percent lipid, cooking loss, or sensory panel tenderness. In summary, data from this small number of observations suggest that feed efficiency of Angus steer progeny of sires divergent for intramuscular fat EPD may be related to several meat quality factors that influence the value and palatability of beef.

**Key Words:** Beef Cattle, Meat Quality, Residual Feed Intake

## Pastures and Forages

### 59 Protein supplementation of ruminants consuming low-quality cool- or warm-season forage: Differences in intake and digestibility.

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Four steers ( $252 \pm 8$  kg BW; Exp. 1) and four wethers ( $38 \pm 1$  kg BW; Exp. 2) were used in a  $2 \times 2$  factorial design to determine the influence of protein supplementation of low-quality cool- (C3; bluegrass straw) and warm-season (C4; tall grass-prairie hay) forage (6.3 and 5.7% CP, respectively) on intake and nutrient digestion. Steers and wethers were allotted to  $4 \times 4$  Latin squares with 20-d periods. Animals were provided forage at 120% of the previous 5 d average intake. Soybean meal (SBM; 52% CP) was used as the CP supplement. In Exp. 1, feed and digesta were collected on d 16 to 20 for estimation of nutrient digestibility and ruminal fluid was sampled on d 20. In Exp. 2, feed, feces, and urine were collected on d 16 to 20 for calculation of N balance. Contrasts were: 1) supp. vs un supp.; 2) C3 vs C4; 3) supp. · forage type. A supp. · forage type interaction ( $P < 0.01$ ) was noted for forage and total DMI in Exp. 1, with supplementation increasing intake of C4 and C3 forage by 47 and 7%, respectively. DM digestibility responded similarly with a supp. · forage type interaction ( $P = 0.05$ ; supp. increased digestibility 12% with C4 and 9% with C3 forage). Also, supp. · forage type interactions were noted for ruminal liquid retention time ( $P = 0.02$ ; supp. decreased retention time from 15.3 to 11.7 h with C4 and from 9.7 to 9.1 h with C3 forage) and particulate passage rate ( $P = 0.02$ ; supp. increased particulate passage 50% with C4 and 11% with C3 forage). As in Exp. 1, a supp. · forage type interaction ( $P = 0.01$ ; supp. increased digestibility 18% with C4 and 7% with C3 forage) was observed with DM digestibility in Exp. 2. In contrast, only supplementation effects were noted for N balance ( $P = 0.002$ ) and N digestibility ( $P < 0.001$ ), which increased with supplementation. These data suggest that intake and digestion of low-quality C3 and C4 forages by ruminants are not similar and, more importantly, intake, digestion, and some ruminal fermentation parameters do not respond comparably to protein supplementation of C3 and C4 forages.

**Key Words:** Cattle, Metabolism, Sheep

### 60 Sheep grazing wheat summer fallow and the impact on soil nitrogen, moisture, and crop yield.

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In typical dryland farming areas of Montana, annual precipitation is not sufficient for annual harvest of small grains. Summer fallow in alternate years, is a common method of conserving soil moisture to produce a crop in the following season. Current methods of fallow management are primarily mechanical tillage and spraying with herbicides. Although these methods are effective, they are expensive, making fallow management the highest variable cost associated with dryland grain production. The objectives of this study were to compare the impact of grazing small grains stubble with sheep, as a fallow management tactic, against traditional management practices of chemical and mechanical fallow across two cropping systems on wheat grain yield and soil nitrate-nitrogen and moisture. Fallow management treatments (chemical, mechanical, graze) were imposed, in a randomized complete block split-plot design, on spring wheat-fallow and winter wheat-fallow cropping systems in a 6 ha 45 plot study at Montana State University's Fort Ellis Research Center near Bozeman, MT. Data on treatment impact on wheat yield and soil nitrate-nitrogen and gravimetric water concentration were recorded. Wheat yields did not differ between cropping system ( $P > 0.50$ ). Soil nitrate-nitrogen ( $P > 0.43$ ) and percent gravimetric water ( $P > 0.06$ ) within either spring wheat-fallow or winter wheat-fallow cropping systems did not differ among fallow treatments at 0-15 cm, 15-30 cm, and 30-60 cm soil depths. This study demonstrates that grazing sheep on winter or spring wheat stubble and associated summer fallow does not negatively impact soil nitrate-nitrogen, percent gravimetric water, or subsequent crop yield.

**Key Words:** Small Ruminant, Sustainable Agriculture, Cereal Stubble

## Physiology

### 61 Reproductive performance of heifers offered ad libitum or restricted access to feed for a 140-d period after weaning.

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Reproductive performance was evaluated in heifers born in 4 years that were randomly assigned to either control (fed to appetite; n = 268) or restricted (fed at 80% of that consumed by controls adjusted to a common BW basis; n = 263) feeding during a 140-d postweaning trial, beginning about 2 mo after weaning at 6 mo of age. Heifers were fed a diet of 64% corn silage, 23% alfalfa and 13% of a protein-mineral supplement (DM basis). Restricted fed heifers consumed 26% less feed over the 140-d trial and had lower ADG (0.48 vs. 0.66 kg/d;  $P < 0.001$ ) than control heifers. After the trial, heifers were combined and subjected to an estrous synchronization protocol. Heifers were artificially inseminated at about 14 mo of age and then were exposed to bulls for the remainder of a 51-d breeding season. Differences in BW of restricted and control fed heifers persisted ( $P < 0.01$ ) throughout the prebreeding period (316 vs. 338 kg at approximately 13.5 mo of age) and subsequent grazing season (404 vs. 414 kg at about 19.5 mo of age), but ADG from the end of the 140-d trial to 19.5 mo of age was greater ( $P < 0.01$ ) in restricted heifers than control heifers (0.49 vs. 0.42 kg/d). The proportion of heifers attaining puberty by 14 mo of age was less ( $P < 0.01$ ) in restricted (58%) than control fed heifers (69%). Means of age at puberty were adjusted to reduce bias from differences in proportions of animals that attained puberty, assuming age of puberty to be normally distributed. Adjusted age at puberty was greater in restricted heifers than control heifers (418 vs. 398 d;  $P < 0.05$ ). Mean BW at puberty, predicted from regression of BW on age, was less ( $P < 0.01$ ) in restricted (317 kg) than control (337 kg) heifers. Pregnancy rate from AI did not differ ( $P = 0.3$ ; overall mean = 50%) due to feed level. Final pregnancy rate averaged 87 and 91% for restricted and control heifers, respectively ( $P = 0.15$ ). Accounting for differences in pregnancy rate, amount of harvested feed provided per pregnant heifer was reduced 22% with the level of restriction implemented in this study.

**Key Words:** Heifer Development, Puberty, Pregnancy

### 62 Growth and attainment of puberty in heifers from cows supplemented with linseed meal during early lactation.

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Preliminary studies in our group suggested diets during early lactation for beef cows may influence puberty onset and offspring growth. This study examined the effects of supplementing cows with phytoestrogen rich linseed meal (LSM) during lactation on heifer calf growth and reproduction. Immediately after parturition, multiparous cow-calf pairs were allotted randomly to one of 12 pens, with six pens supplemented with LSM and six pens fed a control pellet consisting primarily of dried distillers grain plus solubles (CON). Both supplements were pelleted, isocaloric, and isonitrogenous and were offered prior to feeding alfalfa hay each day for the first 60 d of lactation. Heifer calves (n = 91)

were followed from birth to 315 d of age. Birth wt, sixty d BW, and actual weaning weights were recorded, and adjusted weaning wt was calculated. On d  $229.2 \pm 1.5$  of age and every 14 d until d  $313.2 \pm 1.5$  of age, heifers were weighed, and venous blood samples were collected for progesterone analysis. Visual body condition score (BCS) was taken on ~d 229, 287, and 313. Birth weights were not different between groups and there was no effect of treatment on d 60 wt ( $P > 0.2$ ;  $39.5 \pm 1.1$  and  $99.7 \pm 2.2$  kg, respectively). There was a tendency ( $P = 0.11$ ) for heifers from LSM cows to have a greater adjusted weaning wt compared to heifers from CON cows ( $254.3$  vs  $243.0 \pm 5.2$  kg). Heifer BCS was not affected ( $P = 0.22$ ) but heifers from LSM cows were heavier ( $P = 0.04$ ) than heifers from CON cows ( $292.4$  vs  $286.1 \pm 2.4$  kg). Previous studies indicated that some heifers start to cycle at 7 mo of age, however in the current study only 27 heifers attained puberty by the completion of the trial (14 CON and 11 LSM;  $P = 0.4$ ). Initial data regarding LSM supplementation during early lactation indicates that LSM does not appear to impact onset of puberty in heifer calves. However, it appears that LSM supplementation may enhance wt gain without influencing BCS of heifer calves. Further research is needed to explain the effects of phytoestrogens on growth and development of livestock. Supported in part by NIH P20RR016741 from the INBRE from NCRR.

**Key Words:** Phytoestrogen, Linseed Meal, Cattle

### 63 Concentrations of glucose, NEFA, thyroxine, and triiodothyronine in primiparous, anestrous, suckled beef cows exposed to bulls.

J. R. C. Wilkinson\*, S. A. Tauck, J. R. Olsen, and J. G. Berardinelli, *Montana State University, Bozeman.*

The objective of this experiment was to determine if bulls affect metabolic factors in postpartum, anestrous, suckled beef cows. The null hypotheses tested in this experiment were that concentrations of glucose, NEFA, thyroxine (T4), triiodothyronine (T3), and T3:T4 ratios do not differ between cows exposed to bulls or steers. Primiparous, crossbred cows were  $67 \pm 3.5$  d ( $\pm$ SE) postpartum at the start of the experiment. Cows were stratified by BW, BCS, calf BW, calving date, sex of calf and dystocia score. Cows were assigned randomly to be either exposed to bulls (EB; n=8) or steers (ES; n=8) 5 h daily for 9 d (D 0 to 8). On D 0, cows in each treatment were halter-restrained in individual adjacent stalls housed in similar but separate open-air sheds. Bulls (n=2) and steers (n=2) were contained in the immediate vicinity of cows, unrestrained and allowed free access to and contact with the frontal aspects of cows. Cows were fitted with indwelling jugular catheters 2 d before D 0. Blood samples were collected daily from each cow at 15-min intervals for 6 h from 1000 to 1600 h. The 5-h exposure period began 1 h after the start of the intensive bleeding period. Glucose was assayed at time 15 and 225 min on D 2 and 8; and, T3 and T4 were assayed at time 225 min only on each day. NEFA were assayed at time 15 and 300 min after the start of intensive bleeding period from D 0 to 8. Glucose concentrations did not differ between EB and ES cows on D 2 and 8 or times 15 and 225 min, and averaged  $81.0 \pm 6.2$  mg/dL. However, mean NEFA concentrations were greater ( $P < 0.05$ ) in ES cows ( $0.262 \pm 0.024$  mmol/L) than in EB cows ( $0.197 \pm 0.020$  mmol/L) over the course of the experiment. Concentrations of T4, T3, and T3:T4 ratios did not differ between EB and ES cows during the experiment. In conclusion, bulls did

not appear to influence systemic glucose and thyroid hormones in primiparous postpartum suckled beef cows. However, it appears that adipose metabolism in postpartum beef cows may be affected by the presence of bulls.

**Key Words:** Bulls, NEFA, Postpartum

**64 Cortisol concentration patterns during acclimatization to facilities and protocols necessary for intensive blood sampling in primiparous, postpartum, suckled beef cows.** J. R. Olsen\*, S. A. Tauck, J. R. C. Wilkinson, and J. G. Berardinelli, *Montana State University, Bozeman.*

The objective was to evaluate of cortisol concentration patterns in postpartum, anestrous, suckled beef cows during acclimatization to protocols necessary for intensive blood sampling. The null hypotheses were that characteristics of cortisol patterns do not differ throughout a 9 d intensive bleeding protocol. Body weight, BCS, dystocia score of cows, days postpartum, and calf BW were  $532 \pm 37$  kg,  $5.3 \pm 0.23$ ,  $1.1 \pm 0.25$ ,  $66.8 \pm 3.5$  d and  $32 \pm 3.5$  kg, respectively, at the start of the experiment. Before the start of the experiment, cows were maintained on pasture. Cows ( $n=8$ ) were fitted with indwelling jugular catheters 2 d before the start of the experiment. Cows were halter-restrained in individual stalls for 6 h daily over 9 d (D0 through 8). Blood samples were collected from each cow at 15-min intervals from 1000 to 1600 h each day. Serum was assayed for cortisol using RIA. Characteristics of cortisol concentration patterns (mean, baseline, pulse frequency, amplitude, duration, and area under pulses) were analyzed by ANOVA. Cortisol concentrations were greater ( $P < 0.05$ ) on D0 (8.38 ng/mL) and D1 (4.41 ng/mL) than D2 through 8 (2.25 ng/mL). There was no change ( $P > 0.05$ ) in cortisol concentrations from D2 through 8. Baseline and area under pulses decreased ( $P < 0.05$ ) from D0 to D2 and did not differ ( $P > 0.10$ ) from D2 through 8. Pulse amplitude was higher ( $P < 0.05$ ) on D0 than D2 through 8. Furthermore, pulse amplitude was higher ( $P < 0.05$ ) on D1 than D8; however, pulse amplitude did not differ from D2 through 8. Pulse duration was higher ( $P < 0.05$ ) on D0 and 1 than D2 through 8. Pulse frequency did not differ ( $P > 0.10$ ) from D0 to 8. In conclusion, it appears that acclimatization of postpartum, suckled beef cows to protocols necessary for intensive blood sample collection occurs within a 48-h period for cortisol concentrations, thereafter, cortisol patterns stabilize and are maintained.

**Key Words:** Cortisol, Acclimatization, Blood Sampling

**65 Comparison of using 7- or 14-d CIDR treatments in an estrous synchronization protocol that included PGF<sub>2α</sub>, timed AI and GnRH in primiparous, suckled beef cows.** S. A. Tauck\*, J. R. C. Wilkinson, J. R. Olsen, and J. G. Berardinelli, *Montana State University, Bozeman.*

The objective was to compare the estrous synchronization response and AI pregnancy rates of primiparous, suckled beef cows using protocols that included controlled internal drug release devices (CIDR) for either 7 or 14 d, PGF<sub>2α</sub> (PG), timed AI (TAI) and GnRH. We tested the hypotheses that the estrous synchronization response after PG injection and AI pregnancy rates do not differ between cows synchronized using a CIDR for either 7- or 14-d. Cows were stratified by calving date, calf

BW, sex of calf, BW, BCS, and presence of a corpus luteum. Cows were then assigned randomly to receive a CIDR for 7 (CIDR7;  $n=25$ ) or 14 d (CIDR14;  $n=25$ ). Each CIDR14 cow received a CIDR on D -31 (D0 = d of PG injection); CIDR were removed 14-d later (D -17) from these cows. Cows received the CIDR14 treatment 74 d (SE;  $\pm 18$  d) after calving. Each CIDR7 cow received a CIDR on D -7, 25 d after the CIDR14 cows received a CIDR. These cows were given a CIDR 99 d (SE;  $\pm 18$  d) after calving. CIDR were removed from CIDR7 cows on D 0 and each CIDR14 and CIDR7 cow was injected intramuscularly with PG. Cows were observed for estrus during the next 60 h from 0600 to 2400 h daily. Cows that exhibited estrus within 60 h after PG were bred by AI 12 h later. Cows that did not exhibit estrus by 60 h were TAI at 72 h after PG and given GnRH (100 ug/cow). The proportion of cows that exhibited estrus after PG was greater ( $P < 0.05$ ) and the interval from PG to estrus was shorter ( $P < 0.05$ ) for CIDR7 cows than for CIDR14 cows. More ( $P < 0.05$ ) CIDR7 cows (60%) were bred by AI 12 h after PG than CIDR14 cows (20%), whereas, more ( $P < 0.05$ ) CIDR14 cows were bred TAI at 72 h after PG than CIDR7 cows. Overall AI pregnancy rates did not differ between CIDR7 (80%) and CIDR14 (72%) cows. These results indicate that using a CIDR for 7 d with PG given upon of removal of CIDR yields a superior estrous synchronization response compared to that of using a CIDR for 14 d followed 17-d after PG. However, both CIDR protocols yield similar and acceptable AI pregnancy rates when combined with TAI and GnRH in primiparous beef cows.

**Key Words:** CIDR, Estrous Synchronization, Cows

**66 Effects of fetal and uterine genotype on placentome morphology in sheep.** W. J. Arndt\*, P. P. Borowicz, A. T. Grazul-Bilska, D. A. Redmer, J. S. Caton, L. P. Reynolds, and K. A. Vonnahme, *Center for Nutrition and Pregnancy, Dept of Animal and Range Sciences North Dakota State University, Fargo, ND.*

A recent study evaluated uterine capacity in a prolific [Romanov (R); litter size=3 to 5] breed compared to a common U.S. breed [Columbia (C); litter size =1 to 3], reporting R uterine environment lowered fetal and total placental wt regardless of fetal breed. We hypothesized that fetal and/or ewe breed impacts placentome (PLAC) morphological type (i.e. types A, B, C, and D). On d 3 after breeding, one embryo from R or C donor ewes was transferred into either a R or C ewe, resulting in R embryos in R recipients (RR,  $n = 9$ ), R embryos in C recipients (RC,  $n = 4$ ), C embryos in R recipients (CR,  $n = 7$ ), and C embryos in C recipients (CC,  $n = 8$ ). On d 130, individual PLAC wt, diam., morphological types, and total number of PLAC were recorded. There was no difference in the total number ( $70.3 \pm 2.5$ ) of PLAC. However, both C fetal and uterine breed had a greater ( $P < 0.07$ ) % type A compared to type B and C PLAC, whereas R fetal and uterine breed had a greater % ( $P < 0.01$ ) of type A PLAC than type B, C, and D PLAC. Further, R had an increased % type A PLAC compared to C (74.3 vs.  $45.5 \pm 6.4\%$ ). Regardless of uterine or fetal breed, Type D PLAC were heavier ( $P < 0.01$ ) than all other types, type C heavier than type A, and type B being similar in wt to types A and C. While C fetuses had heavier ( $P = 0.05$ ) individual PLAC compared to R fetuses ( $10.1$  vs.  $7.7 \pm 0.9$  g), PLAC in R uteri were heavier than PLAC in the C uteri ( $10.4$  vs.  $7.3 \pm 1.1$  g). For C fetuses or uteri, there was no difference among types as a % of total PLAC wt. However, for both R fetal and uterine breed, type A PLAC made up the majority (~70%) of total PLAC wt ( $P < 0.03$ ). PLAC diam. was larger ( $P = 0.05$ ) in RC

vs. CC, with RR and CR intermediate [3.5 vs. 2.6, and 3.0 and 2.9 cm (SE = 0.3) for RC vs. CC, and RR and CR, respectively]. Types A and B PLAC were smaller ( $P < 0.01$ ) than type C and D PLAC from C fetuses, whereas in R fetuses type A PLAC were smaller ( $P = 0.04$ ) than types B, C, and D, which were similar. The overall reduction in fetal and placental wt in R recipients may be due to a greater proportion of smaller type A PLAC comprising the majority of PLAC in the R uterus during pregnancy.

**Key Words:** Placentome, Pregnancy, Ewe

**67 Effects of maternal dietary restriction and selenium (Se) intake on placentome development and cell proliferation in the ewe.** L. A. Lekatz\*, J. S. Caton, P. P. Borowicz, D. A. Redmer, L. P. Reynolds, and K. A. Vonnahme, *Center for Nutrition and Pregnancy, Dept of Animal and Range Sciences North Dakota State University, Fargo, ND.*

To examine effects of maternal nutrient restriction and dietary Se on placentome development and cellular proliferation, pregnant Targhee-cross ewe lambs ( $n = 36$ ;  $53.8 \pm 1.3$  kg BW) were randomly allotted to 1 of 4 treatments in a 2 · 2 factorial arrangement. Factors were nutrition [maintenance (M) vs. 60% maintenance (R)] and dietary Se [no added Se,  $7.4 \mu\text{g/kg}$  BW (NSe) vs. Se-enriched yeast,  $81.5 \mu\text{g/kg}$  BW (HSe)]. Se treatments were initiated 21 d before breeding and nutritional treatments on d 64 of gestation. All diets were similar in CP (16%) and energy density (2.12 Mcal/kg). At slaughter (d 135 ± 5 of gestation), the gravid uterus was removed, weighed, frozen, and/or perfusion-fixed. There was no effect of diet on placentome number or wt, caruncular (CAR; maternal placental) or cotyledonary (COT; fetal placental) wt; CAR cellular proliferation; CAR DNA, RNA, or protein concentration; CAR or COT RNA:DNA, or CAR protein:DNA. M ewes had greater ( $P = 0.05$ ) COT protein concentration compared to R ewes ( $50.9$  vs  $42.7 \pm 1.95$  mg/g). There was a tendency ( $P = 0.08$ ) for an increased number of proliferating COT cells in HSe compared to NSe ewes ( $6.6$  vs  $4.0 \pm 0.65$  per  $195.7 \mu\text{m}$ ) and in R compared to M ewes ( $P = 0.08$ ;  $6.5$  vs  $4.1 \pm 0.65$ ). R ewes had greater ( $P = 0.06$ ) COT RNA ( $4.3$  vs  $3.7 \pm 0.17$  mg/g) and COT Protein:DNA ( $P = 0.06$ ;  $15.8$  vs  $12.4 \pm 0.85$ ) compared to M ewes. Both COT RNA and DNA tended to be greater ( $P = 0.09$ ) in HSe compared to NSe ewes ( $4.3$  vs  $3.7 \pm 0.17$  mg/g, and  $3.9$  vs.  $3.1 \pm 0.2$  mg/g). Although there was no Se by nutrition interaction, fetuses from HSe ewes were heavier than those of NSe ewes ( $P = 0.08$ ;  $4.03$  vs  $3.63 \pm 0.16$  kg) and fetuses of M ewes were heavier than those of R ewes ( $P = 0.06$ ;  $4.05$  vs  $3.62 \pm 0.16$  kg). It appears that moderate maternal intake and/or supplemental Se during pregnancy tends to increase fetal wt in the absence of increases placental, CAR, or COT wt. However, these nutritional treatments during pregnancy may influence the cellularity and function of the COT. Supported by USDA NRI#2004-04536 to JSC, KAV, & DAR; NIH P20RR016741 from the INBRE from NCRR.

**Key Words:** Placentome, Sheep, Nutrition

**68 Study of the PortaSCC<sup>®</sup> milk test to estimate somatic cell count (SCC) and detect subclinical mastitis in sheep.** E. Kretschmer\*<sup>1</sup>, D. Holcombe<sup>1</sup>, E. Huether<sup>1</sup>, D. Redelman<sup>2</sup>, and G. Fernandez<sup>1</sup>, <sup>1</sup>University of Nevada, Reno, <sup>2</sup>Sierra Cytometry/ UNR Cytometry Center., Reno, NV.

An on-farm test for determining udder health would benefit sheep producers. The PortaSCC<sup>®</sup> milk test is a rapid cow-side test which uses a test strip that requires a small drop of milk and produces a blue color proportional to the somatic cell count (SCC) in the milk. The strip color can be read by visual comparison to a color chart or quantitatively with a reflectometer. The objective of this study was to assess the effectiveness of the PortaSCC<sup>®</sup> milk test to estimate SCC and detect subclinical mastitis in sheep. Ninety-two Rambouillet-Merino ewes were milk sampled from each udder half at weaning ( $89 \pm 16$  d; mean ± SD) and 24 h post-weaning. Milk samples were analyzed for SCC by PortaSCC<sup>®</sup> test and compared to SCC obtained by flow cytometry (FC) and traditional methods (TM) using a Bentley 2000 component analyzer. The SCC corresponding to no color change (NC), light blue (LB), blue (B), and dark blue (DB) on the color chart were  $< 200$  ( $< 5.3 \log_{10}$ ),  $200$  ( $5.3 \log_{10}$ ),  $750$  ( $5.9 \log_{10}$ ) and  $2,000 \times 10^3$  cells/mL ( $6.3 \log_{10}$ ), respectively. Flow cytometry SCC values were  $244 \pm 153$ ,  $364 \pm 516$ ,  $446 \pm 516$  and  $9,097 \pm 607 \times 10^3$  (mean ± SE) and  $5.2 \pm .02$ ,  $5.5 \pm .07$ ,  $5.6 \pm .06$  and  $6.2 \pm .09 \log_{10}$  for NC, LB, B and DB, respectively, with 204, 18, 18 and 13 udder sides reported for each color respectively. Traditional SCC values for NC, LB, B and DB were  $131 \pm 146$ ,  $351 \pm 595$ ,  $991 \pm 538$  and  $11,889 \pm 652 \times 10^3$ , respectively and  $4.9 \pm .03$ ,  $5.3 \pm .10$ ,  $5.6 \pm .09$  and  $6.5 \pm .15 \log_{10}$ , respectively. Actual SCC values for NC, LB, and B did not differ and were lower ( $P < .0001$ ) than DB;  $\log_{10}$  transformation values, however, increased ( $P < .02$ ) as color became darker. Cell counts positively correlated with the % reflectance for FC ( $r = .77$ ,  $P < .0001$ ) and TM ( $r = .85$ ,  $P < .0001$ ). Although no difference ( $P > .7$ ) was noted between colors NC, LB and B for SCC, values in  $\log_{10}$  transformation differed among colors. Our results suggest the PortaSCC<sup>®</sup> milk test is suitable for determining SCC and udder health status.

**Key Words:** Mastitis, Somatic Cell Count

**69 Effects of supplementation of tasco-ex on infertility in young male goats experiencing heat stress.** D. T. Yates\*<sup>1</sup>, M. W. Salisbury<sup>2</sup>, and H. Anderson<sup>3</sup>, <sup>1</sup>New Mexico State University, Las Cruces, <sup>2</sup>Angelo State University, San Angelo, TX., <sup>3</sup>Anderson Consulting, Garden City, KS.

A study was conducted at the Angelo State University Research Center to determine the effects of supplementation of the kelp extract product, Tasco-EX, on physical and fertility traits in young male goats challenged by heat stress. Twenty genetically similar young Boer bucks were randomly divided into two equal experimental groups. The first group received tri-weekly dosage of Tasco-EX so that the total weekly supplementation for each goat was 35g. The second group received no Tasco-EX and served as the control. All goats were held under feedlot-type conditions and identical high-energy diets were offered ad libitum. Supplementation spanned an 84-d period during which weekly average high temperatures ranged from  $32.1$ - $38.2^\circ$  C. Data were collected for scrotum growth, ADG, live-animal ribeye area (REA), and rectal temperature as well as sperm-cell concentration (both visual estimation and hemacytometer count) and sperm-motility grade (1-7 score). No effects were observed on scrotal circumference growth ( $P = 0.22$ ) or final REA ( $P = 0.75$ ). Average daily gain was not affected on a periodic ( $P = 0.72$ ;  $P = 0.32$ ) or total ( $P = 0.75$ ) basis. Rectal temperatures were surprisingly higher ( $P = 0.01$ ) for the supplemented group than the control by an average of almost  $0.2^\circ$  C. Although no differences were observed for sperm-motility grades ( $P = 0.23$ ) or visual estimations of concentration ( $P = 0.41$ ) in semen samples

collected via electroejaculation, actual sperm-cell concentration data revealed a 1.2 billion cells/mL average increase in the supplemented group over the control ( $P = 0.10$ ). These data suggest supplementation of Tasco-EX to young male Boer goats can maintain sperm cell concentrations despite increased body temperature. Future examination of the product's effects on morphology will provide a clearer picture of the effects on overall fertility.

**Key Words:** Tasco, Kelp Extract, Brown Seaweed

**70 Lifespan of sprague dawley rats immunized with an LHRH fusion protein.** A. D. Mitzel\*, J. A. Hernandez, N. S. Cummings, V. A. Conforti, D. M. de Avila, M. A. Evans, and J. J. Reeves, *Washington State University, Pullman, Washington, USA*.

The first objective of this study was to evaluate the effectiveness of an LHRH fusion protein in suppressing reproductive function in male Sprague Dawley rats ( $n=90$ ). Even though this procedure is producing an autoimmune disease, we hypothesize that immunocastration would not have a negative impact on the lifespan of rats. To test this hypothesis

male rats were immunized with a recombinant ovalbumin-luteinizing hormone-releasing hormone (oval-LHRH) fusion protein to examine the effects of immuno-castration on lifespan. The immunized rats were given a primary injection of oval-LHRH with complete Freund's adjuvant followed by two boosters of oval-LHRH and incomplete Freund's 4 and 8 wk later. The intact rats in the control group were injected with recombinant ovalbumin alone using the same adjuvant. Blood samples and testicular measurements were collected on 28-day intervals. Efficacy of the vaccine was determined by concentrations of LHRH antibodies associated with testicular atrophy. Of the LHRH immunized rats 97.8% responded generating antibodies against LHRH coupled with testicular regression. The effect of LHRH immunization on lifespan was examined by comparing the age at which time 50% of each treatment group died. This 50% survival time for the intact control rats was 22.5 with a SE of 1.5 and the immunized 26 months with a SE of 0.5. Based on the Wilcoxon test for comparison of survival curves, there was a notable, but non-significant difference in survival between immunized and control groups ( $P=0.074$ ). This is an important observation in the consideration of using such vaccines in controlling reproduction in wild, feral or pet animals.

**Key Words:** Immunocastration, LHRH, Lifespan

## POSTER PRESENTATIONS

### Environment and Livestock Management

**71 Relationship of dam's body weight, milk components, and milk energy density to reindeer calf growth rate.** M. P. Shipka\*<sup>1,3</sup>, J. E. Rowell<sup>1</sup>, and A. J. Young<sup>2</sup>, <sup>1</sup>*University of Alaska, Fairbanks*, <sup>2</sup>*Utah State University, Logan*, <sup>3</sup>*Washington State University, Pullman*.

Reindeer are important livestock species in Alaska. The level of reproductive management in herds is currently low. A goal of producers is to wean large calves. Current efforts to develop AI require identification of traits related to calf growth rate worthy of selection. Objectives of this trial were to relate dam body weight at parturition to calf growth rate and to examine associations of reindeer milk components to calf growth rate. Twelve reindeer cows were randomly divided into two groups. Estrus was synchronized for early breeding (EB;  $n=6$ ) or late breeding (LB;  $n=6$ ). Breeding was by a single reindeer bull. Dam body weight and calf birth weight were recorded at parturition. Calving date ranged from Apr. 6 to 11 for EB and from Apr. 23 to 30 for LB. Milk samples were collected from cows at 10, 40 and 70 d postpartum. Calf body weight was recorded coincident with milk sampling and average daily gain (ADG) was calculated for each period and for the entire 70 d study. Milk samples were sent to Rocky Mountain DHIA (Logan, UT) for component analysis. Two formulas were used to estimate milk energy density. Pearson correlation coefficients were calculated for ADG with dam body weight at parturition, milk components and milk energy. Overall mean ADG was  $0.66 \pm 0.06$  kg (range 0.53 to 0.89 kg) and was not different between groups. Dam body weight was correlated with 70 d ADG ( $r=.57$ ;  $p=.04$ ). In EB, 10d ADG was correlated with milk energy ( $r=.92$ ;  $p=0.01$ ), %fat ( $r=.91$ ;  $p=0.01$ ) and %solids ( $r=.93$ ;  $p=0.01$ ). Milk components appear to be more important to EB calves than LB

calves in early life. Reindeer calves are precocious and nibble grass soon after birth. From this study, it appears that milk components play a big role in early born calves when snow cover prevents access to grass.

**Key Words:** Reindeer Milk, Calf Growth

**72 Impact of equine anthelmintics on dung beetle reproduction.** T. Black<sup>1</sup>, E. Lewis\*<sup>1</sup>, B. Clymer<sup>2</sup>, and J. L. Beckett<sup>1</sup>, <sup>1</sup>*California Polytechnic State University, San Luis Obispo*, <sup>2</sup>*Fort Dodge Animal Health, Amarillo, TX*.

Scarabaeidae, commonly known as the dung beetle, refer to those beetles which feed on the feces of animals thus benefiting the environment by increasing water infiltration, removing the breeding habitat for pests, and improving nutrient recycling. The objective of this study was to evaluate toxicity of the equine anthelmintics, Ivermectin versus Moxidectin, on dung beetle reproduction. Manure was collected from a control group consisting of six horses, unexposed to any equine anthelmintics for a period of ninety days. The horses were randomly divided into two groups and dewormed with Ivermectin (Avermectin) or Quest (Moxidectin). Following treatment, fresh manure was collected on days 1, 7, 14, and 21 from the two groups. Adult dung beetles, *Onthophagus gazella*, were separated into thirty different containers and fed treated or untreated manure according to the container they were restricted to. Containers contained a mixture of soil and four to five breeding pairs of adult dung beetles. After a ninety-day period, offspring were collected and counted to determine

the effects of the equine anthelmintics on dung beetle reproduction. An analysis of variance was performed using a general linear model to show the survivability of dung beetle offspring and produced the following results. On day 1, Ivermec and Quest had low survivability compared to the Control ( $P < .05$ ). On days 7 and 14 Ivermec had low survivability compared to Quest and Control ( $P < .05$ ), but Quest and Control did not differ ( $P > .05$ ). On day 21, there was no dung beetle survivability difference between Ivermec, Quest, and Control ( $P > .05$ ). These results indicated that the equine anthelmintic, Moxidectin, was less toxic than Avermectin on dung beetle reproduction.

**Table 1. Comparison of Dung Beetle Offspring Survival**

Treatment	Day 1	Day 7	Day 14	Day 21
Control	5.50 <sup>®</sup>	5.50 <sup>®</sup>	5.50 <sup>®</sup>	5.50 <sup>®</sup>
Ivermec	1.00 <sup>®</sup>	1.00 <sup>®</sup>	0.67 <sup>®</sup>	3.67 <sup>®</sup>
Quest	1.00 <sup>®</sup>	6.00 <sup>®</sup>	5.33 <sup>®</sup>	7.33 <sup>®</sup>

<sup>®</sup> Different letters in rows indicate significant difference ( $P < .05$ ).

**73 Beef cow performance in response to early through mid-gestational nutrient restriction and provision of supplementary ruminally undegradable protein.** P. L. Price\*, M. Du, S. I. Paisley, V. Nayigihugu, J. D. Hess, and B. W. Hess, *University of Wyoming, Laramie.*

Twelve triparous and 24 diparous cows ( $500 \pm 7.6$  kg initial BW) were individually fed native grass hay plus 1 of 3 supplements from d 45 through d 185 of gestation to evaluate effects of gestational dietary treatment on BW, BCS, and ultrasonographic LM area, fat within the LM, and fat depth over the 12<sup>th</sup> rib. Dietary treatments were native grass hay plus a soybean meal-based supplement formulated to achieve 0.51 kg/d of BW gain (C), 70% of  $NE_m$  provided by C (NR), and 70% of  $NE_m$  provided by C plus a ruminally undegradable protein (RUP) supplement (6.8% porcine blood meal, 24.5% hydrolyzed feather meal, and 68.7% menhaden fishmeal; DM basis) designed to provide duodenal essential AA flow equal to that of cattle fed C (NRP). Data were analyzed as a split-plot in a randomized complete block (parity) design. Dietary treatment  $\times$  d of gestation interactions were noted ( $P < 0.05$ ) for all variables except for fat depth over the 12<sup>th</sup> rib. Cows fed C had significantly greater BW, BCS, and LM area than NR from d 73 through 185 (final BW = 584 vs. 521 kg). Body weight and LM area of NRP cows were intermediate until d 115; NRP cows had significantly greater BW and LM area than NR cows thereafter, but BW and LM area of NRP cows did not differ from C cows throughout the experiment. Body condition score of NRP cows was similar to both C and NR throughout the experiment. Fat within the LM was greatest for C on d 157; fat within the LM was similar among dietary treatments at all other collection dates. Average DMI by NR was 3.1 kg/d less than C cows, and NRP cows consumed 2 kg/d less DM than cows fed C. Differences in beef cow performance during early to mid-gestation were attributable to differences in plane of nutrition; however, cows fed a RUP supplement designed to balance intestinal supply of essential AA were able to withstand this period of nutrient restriction. Provision of supplemental protein balanced for intestinal supply of essential AA may be an effective nutritional management strategy to increase production efficiency of pregnant beef cows consuming limited amounts of forage.

**Key Words:** Beef Cows, Nutrient Restriction, Supplementation

**74 Effect of copper supplementation on artificial insemination conception rate of Angus cows and feedlot performance of Angus bulls.** N. A. Dunbar, B. J. May, M. W. Salisbury\*, C. B. Scott, and M. T. Schafer, *Angelo State University, San Angelo, TX.*

Copper (Cu) oxide boluses were administered in two trials to evaluate their effects on conception to Artificial Insemination (AI) in Angus cows (2 to 12 yrs) and heifers (7 mo of age) and feedlot performance in Angus bulls. Trial 1; 68 Black Angus cows/heifers ranging from 1-12 y of age were blocked by age (0, 1 or multiple pregnancies) and randomly assigned to one of three treatment groups (Trt); Trt 1) Control-no Cu supplementation, Trt 2) 1 Cu bolus on d 180, Trt 3) Cu boluses, d 0 and d 180. Blood plasma samples were taken and analyzed for Cu concentrations in both trials on days 0 (Cu administration), 7, 14, 28, 56, and at 56-day intervals thereafter. Sampling began when current calves were weaned and continued until the next calf was weaned. Cows and heifers were synchronized and AI on d 190 - 200. Pregnancy was determined 56 d post AI using an ALOKA 500 ultrasound with a 7 MHz transducer rectally. There were no differences ( $P > 0.05$ ) in conception among treatments. Copper supplementation resulted in heavier ( $P < 0.05$ ) calf birth weights than in unsupplemented cows. In Trial 2; 20 yearling Angus bulls were randomly assigned to one of two Trt; Trt 1) Control, Trt 2) Cu bolus on d 0 (weaning and placed on feed). Treatment 2 had a greater ( $P < 0.01$ ) average daily gain (ADG) than Trt 1. Results show that Cu did not increase conception to AI but may increase birth weights in fetuses and ADG in fed Angus bulls. The increase in calf birth weights was unexpected and can not be fully explained. Additional research is needed to better understand the increase in birth weights and determine potential production concerns with supplementing Cu.

**Key Words:** Copper, Performance, Conception

**75 The effect of protein level on feedlot performance and carcass characteristics of Texas Rambouillet ewes.** N. Mendoza<sup>1</sup>, B. J. May\*<sup>1</sup>, M. W. Salisbury<sup>1</sup>, G. R. Engdahl<sup>1</sup>, and G. G. Hilton<sup>2</sup>, <sup>1</sup>Angelo State University, San Angelo, TX, <sup>2</sup>Oklahoma State University, Stillwater.

Aged Rambouillet ewes, 5 to 7 years old, are usually culled in Texas. Some producers have chosen to feed their aged ewes high energy diets, a feedlot practice, before they send them to harvest. This practice may prove to be profitable as the ewes will gain extra weight and bring more money at sale time. Research on the feedlot performance of aged ewes is very limited. The purpose of this research is to compare protein level on feedlot performance (rate and efficiency of gain) and carcass composition in aged Rambouillet ewes. A total of 28 ewes were blocked by weight and (body condition score) BCS, and randomly assigned to a pen. The pens measured 3.048 m by 9.144 m. Ewes were placed in one of 14 pens with two ewes per pen. Pens were allocated to one of three different treatments consisting of wheat hay (WH), soybean hulls (SBH), and a balanced grain ration (GR). These treatments resulted in varying amounts of protein. Ewes were weighed every 28 days and kept on trial for 84 days. Carcass characteristics were measured after carcasses were chilled for 24 hours. The trial consisted of 28 ewes in 14 different pens, four pens on WH, five pens on SBH, and five pens on GR. Performance was greater ( $P < 0.05$ ) for ewes on GR for total gain, ADG, BCS and BCS change. Feed efficiency was also better ( $P < 0.05$ ) for GR as compared to WH and

SBH. Ewes on GR had greater ( $P < 0.05$ ) fat depth at the twelfth rib than SBH or WH and SBH ewes were fatter than WH with no differences ( $P > 0.05$ ) across treatments in carcass weights or dressing percents. Upon evaluation of the economic data, the feeding of aged ewes in a down market appears to be unprofitable and actually resulted in a loss. However, if the market remained steady, profit could be gained by feeding aged ewes. This only shows that further focus of commercial operations is needed to determine the actual profitability of feeding aged ewes.

**Key Words:** Rambouillet Sheep, Protein, Carcass

**76 Use of N-alkanes to estimate seasonal intake, digestibility, and diet composition of small ruminants grazing in California chaparral.** N. Narvaez\* and W. Pittroff, *University of California, Davis.*

Livestock grazing for the intended purpose of reducing the fire hazard associated with the accumulation of fuel load in Chaparral is a strategy to assist human settlements at-risk. To successfully implement a prescribed grazing regime in chaparral, dry matter intake (DMI), digestibility (DOM), and diet composition (DC) of herbivores must be determined. This study was conducted to determine seasonal variation in DMI, nutrient content and DMD of plants used by sheep and goats grazing in chaparral using the alkane method. Six male Kiko goats (average weight  $22.9 \pm 2.7$  kg) and six wether Targhee sheep (average weight  $39.6 \pm 0.66$  kg) were used during fall, spring and summer to measure DMI and DC. Animals were orally dosed with n-alkane control release capsules using intraruminal controlled release devices. N-alkane profiles in fecal and plant samples were used to estimate DC and DMI. Overall DMI was 0.93, 1.11, and 1.33 kgDM/d for goats and 0.81, 1.21, and 0.79 kgDM/d for sheep in fall, spring and summer, respectively. DMD, CP, and ME contents of the selected diets by goats in fall and summer were higher ( $P < 0.05$ ) than that of sheep. In spring, DMD, protein (CP) and energy (ME) were higher ( $P < 0.05$ ) in diets selected by sheep compared to diets selected by goats. The proportions of browse in the consumed diet were 78%, 87%, and 95% by goats and 73%, 59%, and 82% by sheep, in fall, spring and summer, respectively. Chaparral species consumed by goats and sheep during all periods were chamise, oak, ceanothus and grass. Chamise was an important ( $P < 0.05$ ) species for goats in spring and sheep in summer. Sheep consumed more oak in fall and grass in spring than goats did. This study indicates that, faced with similar opportunities for choice, sheep and goats select fairly similar species, but in different proportions at different seasons. CP and ME in diets of goats and sheep were deficient in all seasons, thus, feed supplementation is required to ensure productivity and health of small ruminants grazing chaparral and predict efficacy of their use in vegetation management programs to reduce fuel load in chaparral.

**Key Words:** Small Ruminants, Intake, Diet Composition

**77 Effect of cobalt supplementation and estrous synchronization on body weight gain and conception rates in yearling ewes and peripubertal ewe lambs.** G. E. Moss\*<sup>1</sup>, K. M. Cammack<sup>1</sup>, B. A. Larson<sup>1</sup>, B. M. Alexander<sup>1</sup>, R. H. Stobart<sup>1</sup>, W. J. Hill<sup>2</sup>, and B. W. Hess<sup>1</sup>, <sup>1</sup>*Department of Animal Science, Laramie, WY*, <sup>2</sup>*Ralco Nutrition, Marshall, MN.*

Conception rates of peripubertal ewe lambs during the fall following their birth and yearling ewes influences flock productivity and economic returns. Our objectives were to evaluate the influence of cobalt (Co) supplementation and estrus synchronization on growth performance and conception rates. Yearling ewes ( $n = 50$ ) and peripubertal ewe lambs ( $n = 63$ ) were sorted by breed (Suffolk, Hampshire, Rambouillet, Columbia), allocated to 1 of 8 pens (2 pens/breed), and fed control supplement (0.12 kg distillers grain/h/d) or control supplement containing Co (10 mg) for 28 d before and 14 d into the breeding season. All animals received 0.91 kg/d alfalfa hay and 0.91 kg/d grain-based supplement (15% CP, DM basis). On d 1 of the breeding season, estrous cycles of one-half of the ewe lambs from each age group in each pen were synchronized by treatment with GnRH (d 1; 100  $\mu$ g) and PGF<sub>2</sub> $\alpha$  (d 7; 12.5 mg). Fertile rams fitted with marking harnesses were placed with all ewes on d 1 for a 35 d breeding period. Pregnancy status of all animals was confirmed by ultrasound 60 d after ram removal. Supplementation with Co did not influence ( $P = 0.49$ ) ADG or d to estrus ( $P = 0.76$ ). Synchronization tended to increase ( $P = 0.07$ ) the proportion of ewes in estrus during the 10 d interval following PGF<sub>2</sub> $\alpha$  administration from 49.4% to 62.0%. However, synchronization did not ( $P = 0.84$ ) influence overall conception rates. Breed (82.3, 93.8, 75.0, and 90.0% for Columbia, Hampshire, Rambouillet and Suffolk, respectively;  $P = 0.10$ ) and age (90.1 vs. 80.2% for yearling and peripubertal ewe lambs, respectively;  $P = 0.09$ ) tended to influence conception rates. Inclusion of supplemental Co in diets of yearling ewes or peripubertal ewe lambs prior to, and early in the breeding season did not influence ADG, d to estrus, or conception rates. Synchronization of estrus with the GnRH and PGF<sub>2</sub> $\alpha$  did not influence overall conception rates but tended to increase the proportion of ewes mated by the 10th day of the breeding season to values that would be predicted (62.5%) if all ewes were exhibiting estrous cycles.

**Key Words:** Cobalt, Estrus, Ewes

**78 Effect of field pea and flaxseed inclusion in receiving calf diets and carryover effect on finishing performance, immune response, carcass quality, and economics.** D. G. Landblom\*<sup>1</sup> and C. J. Wachenheim<sup>2</sup>, <sup>1</sup>*North Dakota State University, Dickinson*, <sup>2</sup>*North Dakota State University, Fargo.*

One hundred seventy-three medium-frame crossbred steers (initial BW of  $293 \pm 0.519$  kg) were randomly assigned in a 3 year study to evaluate finishing carryover effect when field pea and flaxseed replaced fiber-based ingredients in 50 d receiving calf diets to determine subsequent feedlot performance, immune response, carcass quality, finishing economics, and net return to retained ownership in the cow-calf enterprise. Each year, steers were assigned to one of four pelleted receiving diets: 1) Control (C), 2) 12.5% Flaxseed (FLX), 3) 20.0% Field Pea (PE), and 4) 20.0% Field Pea + 12.5% Flaxseed (PFLX). Pellet NEg was 1.12, 1.26, 1.17, and 1.26 Mcal/kg for C, FLX, PE, and PFLX, respectively. Receiving diet ADG was greater ( $P < 0.05$ ) when FLX occurred in the diet and there was a tendency for improved efficiency ( $P = 0.075$ ) when FLX was present. Feed cost/kg of gain was lowest for FLX and PFLX treatments ( $P < 0.05$ ). Finishing calf receiving weight, harvest weight, DOF, Gain, ADG, ADFI, and G:F did not differ ( $P < 0.05$ ). The effect of receiving diet on carcass measurement did not effect HCW, QG, or USDA % Choice grade ( $P > 0.05$ ). Flaxseed inclusion in the receiving diet was associated with reduced REA ( $P = 0.04$ ), a tendency for greater fat depth ( $P = 0.074$ ),

and less favorable YG ( $P = 0.083$ ). Flaxseed has been reported to illicit an immune response that reduces morbidity, increases % IMF, while reducing BF. Replacing fiber-based ingredients with FLX did not reduce either morbidity or medical treatment cost/head ( $P = 0.96$ ). Finishing net return (NR) was effected by yearly fed cattle prices ( $P = 0.0001$ ); however, response due to receiving diet treatment did not differ ( $P = 0.943$ ). Retained ownership NR favored receiving diet treatments that contained field pea. Results suggest that FLX and PFLX are associated with reduced feed cost/kg of gain during the receiving period; however, when retained through finishing, receiving diets formulated with PE and PFLX were associated with the highest finishing net return.

**Key Words:** Beef Cattle, Field Pea, Flaxseed

**79 Readability of thirteen different RFID ear tags by three different multi-panel reader systems for use in beef cattle.** L. Wallace\*, J. Paterson, A. Ankney, R. Clark, A. Kellom, M. Harbac, and M. Miller, *Montana State University, Bozeman*.

The objectives of this research were to compare the readability of thirteen different radio frequency identification (RFID) ear tags scanned by three different multi-antenna alley readers (single-lane,

dual-lane and multi-animal) using 82 Angus heifers. The readability and flow rates of the heifers were measured through either an 1) Allflex Single-Lane Multi-Panel RFID Reader (ASL; 63.5 cm · 3.05 m), 2) an Allflex Dual-Lane Multi-Panel Reader (ADL; 81.8 cm · 3.06 m) or 3) a Boontech Alley Master Multi-Panel Multi-Animal Alley Reader (BAM; 1.37 m · 9.7 m). Three of the RFID tag brands were half-duplex (HDX) technology: Allflex, Dalton, and Leader while the remaining 10 RFID brands were full-duplex (FDX) technology: Allflex, Animal Profiling Inc. (API), Dalton, Destron1, Destron2, Leader, Verilogic, Y-Tex1, Y-Tex2 and Z-Tag. Observations were measured at different time periods. A total of 5570 observations were collected through the ASL system, 3280 through the ADL system and 3280 through the BAM system. Due to the differing alley dimensions, cattle moved through the three systems at different ( $P < 0.05$ ) flow rates (1.3, 2.1 and 8.7 m/sec) for ASL, ADL and BAM, respectively. When the readers were fully tuned and upgraded, readability did not differ ( $P > 0.05$ ) for the ASL (99.4%), ADL (99.5%) or BAM (99.7%) systems. Readability of the nine top performing HDX (98.2%) and FDX (96.5%) RFID tags did not differ ( $P > 0.05$ ). All flow rates met the National Animal Identification System (NAIS) standards (1 m/sec) set by the USDA. All readers met USDA 95% readability standards when fully tuned and upgraded. Results indicate that it is possible to get read rates that follow standards set by the USDA.

**Key Words:** RFID, NAIS, Ear Tag

## Food Safety

**80 Effects of season, management, and diet on prevalence of Shiga toxin-producing *Escherichia coli* in dairy cattle.** L. M. Bollinger\*<sup>1</sup>, H. S. Hussein<sup>1</sup>, and E. R. Atwill<sup>2</sup>, <sup>1</sup>*University of Nevada, Reno*, <sup>2</sup>*University of California, Davis*.

Shiga toxin-producing *Escherichia coli* (STEC) caused numerous outbreaks of human illnesses worldwide. Because dairy cattle are STEC reservoirs, contamination of their products continues to be a human health risk. Several STEC outbreaks were traced to beef from culled dairy cows, water, or produce contaminated with cattle feces. To identify on-farm factors that decrease STEC prevalence, four dairy farms (averaging 712 cows) in California were used. A total of 1,268 fecal samples were collected from heifers ( $n = 261$ ) and cows in first ( $n = 424$ ), second ( $n = 298$ ), or later ( $n = 285$ ) lactations over one year (approximately 80 samples per farm per season). Across seasons, STEC were recovered in all farms at similar ( $P > 0.05$ ) rates (averaging 1.8%). Prevalence rates of STEC were not different ( $P > 0.05$ ) between cows and heifers (averaging 2.0%) and were not affected ( $P > 0.05$ ) by lactation, days in milk (1 to 60, 61 to 150, or  $\geq 151$  d), or season (averaging 1.6, 1.6, and 1.7%, respectively). The STEC isolates

belonged to 16 serotypes (O15:H<sup>-</sup> [a nonmotile isolate], O116:H<sup>-</sup>, O125:H20, O127:H19, O128:H20, O136:H10, O136:H12, O136:H19, O136:HUT [an untypeable H antigen], O157:H7, O157:H<sup>-</sup>, O166:H6, OX13 [a new provisional O antigen]:H19, OX13:H20, OUT [an untypeable O antigen]:H7, and OUT:H<sup>-</sup>). Of these serotypes, three (O157:H7, O157:H<sup>-</sup>, and OUT:H<sup>-</sup>) caused hemolytic uremic syndrome, two (O15:H<sup>-</sup> and OUT:H7) caused other human illnesses, and eight (O125:H20, O127:H19, O128:H20, O136:H10, O136:H19, O166:H6, OX13:H19, and OX13:H20) have not been reported previously in cattle. Prevalence of STEC was not affected ( $P > 0.05$ ) by farm factors such as manure handling, frequency of cleaning the feed bunk, water source, and pen size, type, or density. However, dietary ingredients appeared to affect STEC prevalence. For example, higher ( $P < 0.05$ ) prevalence rates were associated with feeding yeast cultures (2.0 vs 0.6%) and with total or partial replacement of soybean meal with cottonseed meal in the protein supplement (3.8 vs 0.7%). Thus, decreasing fecal shedding of STEC by dairy cattle appears possible by dietary manipulation.

**Key Words:** Food Safety, *Escherichia Coli*, Dairy Cattle

## Growth and Development

**81 Serum thyroxine, triiodothyronine and IGF-1 correlate with posweaning growth and carcass traits in lambs.** C. A. Ayala<sup>1</sup>, J. C. Estrada<sup>1</sup>, G. A. Lara<sup>1</sup>, F. A. Rodríguez-Almeida<sup>1</sup>, J. A. Ramírez-Godínez\*<sup>1</sup>, D. M. Hallford<sup>2</sup>, and G. N. Aguilar<sup>1</sup>, <sup>1</sup>Universidad Autónoma de Chihuahua, Mexico, <sup>2</sup>New Mexico State University, Las Cruces.

Forty two lambs ( $90 \pm 22$  d and  $24 \pm 2.2$  kg) were used to examine relationships between serum concentrations of triiodothyronine ( $T_3$ ), thyroxine ( $T_4$ ) and IGF-1 during the posweaning period and body weight, ADG, feed efficiency and carcass traits. Lambs came from Suffolk (SF), Charollais (CH), Blackbelly (BB), Pelibuey (PB), and Katahdin (KH) rams with BB and PB ewes. Lambs were housed in individual stalls and fed *ad libitum* with a diet of alfalfa hay and concentrate. Served feed andorts were weighed and recorded daily and lambs weighed every 14 d and bled every 28 d for the first 3 samplings and then every 14 d to slaughter (SF and CH = 45 – 50 kg, KH = 40 – 45 kg, BB and PB = 35 – 40 kg). Correlation coefficients between body weight and hormone concentrations were high ( $P < 0.05$ ) for all

sire breed groups ( $r = 0.78 - 0.99$ ). Canonical correlation ( $R_c$ ) analyses were used to determinate the relationship between groups of variables: **WF**, ADG and feed efficiency; **LFC**, weight of liver, kidney and pelvic fat, and carcass traits (rib eye area and fat thickness); **C**, weight of carcass cuts (front and rear legs, and loin) as a percentage of chilled carcass weight; **CC**, percentage of lean, fat and bone in cuts mentioned before; and **HC**, serum hormone concentrations measured at slaughter and at different classes of rates of body weight to slaughter weight: R1, 27 – 58 %; R2, 58.1 – 70 %; R3, 70.1 – 76 %; and R4, 76.1 – 95 %. Variables to be included in the LFC group were selected by principal component analysis. Canonical correlations were important ( $P < 0.05$ ) between WF and HC at slaughter ( $R_c = 0.34$ ) and at R4 ( $R_c = 0.61$ ); between LFC and HC at slaughter ( $R_c = 0.38$ ) and at R1 ( $R_c = 0.78$ ;  $P = 0.07$ ); between C and HC at slaughter ( $R_c = 0.40$ ); and between CC and HC at R3 ( $R_c = 0.88$ ). Serum concentrations of IGF-1,  $T_3$  and  $T_4$  in lambs do relate to posweaning growth and carcass traits, when measured closed to or at slaughter.

**Key Words:** IGF-1  $T_3$   $T_4$ , Growth, Lambs

## Pastures and Forages

**82 Visual obstruction: Weight technique for estimating production on northwestern bunchgrass prairie rangelands.** D. Damiran\*<sup>1</sup>, T. DelCurto<sup>1</sup>, E. Darambazar<sup>1</sup>, A. A. Clark<sup>1</sup>, P. L. Kennedy<sup>1</sup>, and R. V. Taylor<sup>2</sup>, <sup>1</sup>Oregon State University, Union, <sup>2</sup>The Nature Conservancy, Enterprise, OR.

The estimation of standing crop is important in the management of rangeland resources. Direct measurements by clipping, drying, and weighing of herbaceous vegetation are time-consuming and labor-intensive. Therefore, non-destructive methods for efficiently and accurately estimating standing crop are needed in rangeland forage management. We assessed a visual obstruction (VO) technique to estimate standing crop (SC) of northwest native bunchgrass communities at The Nature Conservancy's Zumwalt Prairie Preserve in northeastern Oregon. Five hundred seventy six plots ( $0.5 \text{ m}^2$ ) were subjected to VO measurement; and subsequently, all vegetation within a plot was clipped to ground level. Only current year's crop was taken. Regression analysis was used to evaluate the relationships of VO to standing crop, with standing crop as the dependent variable. Total standing crop was  $1261 \pm 51 \text{ kg ha}^{-1}$  and mean of VO measurement was  $12.8 \pm 0.4 \text{ cm}$  for vegetation in the study site. By growth form of plants, standing crops were  $688 \pm 26$ ,  $13 \pm 26$ ,  $416 \pm 26$ , and  $144 \pm 26 \text{ kg ha}^{-1}$  for grasses, grasslikes, forbs, and shrubs, respectively, and all growth forms differed from each other ( $P < 0.01$ ). A positive ( $P < 0.01$ ) linear relationship occurred between VO and SC measurements, however, correlation was low with only 46% of the variation in standing crop being attributable to VO ( $y, \text{ kg ha}^{-1} = 270.58 + 77.66x, \text{ cm}; r^2 = 0.46, n = 576$ ). In heterogeneous mid-height bunchgrass communities like the Zumwalt Prairie Preserve, the VO technique will not accurately predict standing crop although many wildlife investigators will still find it useful for describing vegetative structure in these communities. Consequently, we recommend that, if considering

VO as a surrogate for SC, investigators should calibrate VO technique against clip plots to evaluate applicability to their situation.

**Key Words:** Biomass, Non-Destructive Technique, Palouse Prairie

**83 Respiratory elimination of selenium in sheep given the accumulator plant *Symphytotrichum spathulatum* (western mountain aster).** A. Wilhelm\*<sup>1</sup>, B. L. Stegelmeier<sup>2</sup>, K. E. Panter<sup>2</sup>, and J. O. Hall<sup>1</sup>, <sup>1</sup>Utah State University, Logan, <sup>2</sup>USDA/ARS Poisonous Plant Research Laboratory, Logan, UT.

Selenium (Se) is a necessary mineral required by mammals and poultry. If toxic amounts are ingested, expired air becomes a potentially important, but poorly investigated, route of elimination. A study was performed to evaluate respiratory toxicokinetics of Se in sheep. Sheep were gavaged with the accumulator plant *Symphytotrichum spathulatum* at Se equivalent doses of 0, 2, 4, 6 or 8 mg/kg BW. As positive controls an additional two sheep were gavaged with purified sodium selenite at 4 mg Se/kg BW and two sheep were gavaged with purified selenomethionine (Se-Met) at 8 mg Se/kg BW. Expired air samples were collected prior to dosing and at 1, 2, 4 and 8 hrs post dosing. Samples were collected from both sheep in the control, selenite and Se-Met groups and from 4 sheep in each of the plant-Se treatment groups. The air Se concentrations of the Se-Met group were statistically higher ( $P < 0.05$ ) than all other groups at each time point of collection. The selenite, 2 and 4 mg plant-Se/kg BW groups all had peak concentrations at the 2 hr collection time. The 8 mg plant-Se/kg BW group showed a linear increase in respiratory Se concentration through 8 hours. The 6 mg plant-Se/kg BW group peaked at 1 hour, then dropped and peaked again at 4 hours and finally dropped between 4 and

8 hours. At 8 hours, the 8 mg plant-Se/kg BW group was significantly higher ( $P < 0.05$ ) than all other groups. The elimination profile for Se-Met was dissimilar to any of the other treatments, with greater than 20 times the concentration of Se in the expired air than the high dose plant Se or the selenite treatments. The 4 mg selenite and 4 mg plant Se had similar elimination profiles, although the 4 mg plant Se had significantly greater ( $P < 0.05$ ) concentrations at 2, 4 and 8 hrs. The total dose of the plant Se appreciably altered the elimination profile. These findings indicate that both dose and chemical form of Se affect respiratory elimination kinetics.

**Key Words:** Sselenium, Sheep, Respiratory Kinetics

**84 Species composition and diversity on northwestern bunchgrass prairie rangelands.** E. Darambazar<sup>\*1</sup>, T. DelCurto<sup>1</sup>, D. Damiran<sup>1</sup>, A. A. Clark<sup>1</sup>, and R. V. Taylor<sup>2</sup>, <sup>1</sup>*Oregon State University, Union*, <sup>2</sup>*The Nature Conservancy, Enterprise, OR*.

Management and conservation of rangelands are increasingly concerned with maintaining productivity, species composition, and diversity of native plant communities. We estimated species composition and diversity of native bunchgrass communities at The Nature Conservancy's Zumwalt Prairie Preserve in northeastern Oregon. One thousand one hundred fifty two plots (0.5 m<sup>2</sup>) were subjected to vegetation measurements. The Shannon diversity index (**H**) was used to characterize species diversity in the study area. Standing crop was estimated by clipping current year's crop to ground level, drying, and weighing and vegetative cover was estimated visually as cover classes. Total standing crop and vegetative cover on the study area were 1261.5 ± 51 kg ha<sup>-1</sup> and 104.6 ± 5%, respectively. Graminoids contributed most to total standing crop (701 ± 26 kg ha<sup>-1</sup>) and vegetative cover (56.5 ± 3%), forbs were the next most abundant group with 416 ± 26 kg ha<sup>-1</sup> and 35.6 ± 3% and shrubs produced 144 ± 26 kg ha<sup>-1</sup> and 12.5 ± 3%, respectively ( $P < 0.01$ ). Native perennials made up 79% of total standing crop with introduced perennials, native and introduced annuals contributing 12, 3, and 4%, respectively. Across the study sites 186 plant species were found, about 80% of which accounted for by native perennial species. Species richness (**S**), diversity (**H**), and evenness (**E<sub>H</sub>**) for the bunchgrass communities were 13.3, 1.8, and 0.7, respectively. Results of the study suggest that native bunchgrasses and perennials in the study area contributed nearly 60% or more to total standing crop, although 16% attributed to invading and/or introduced species. This prairie was low in plant productivity and species diversity but high in evenness of species abundance.

**Key Words:** Aboveground Biomass, Species Richness, Bunchgrass Community

**85 Utilization of corn gluten meal by heifers as a self-fed supplement.** J. T. Mulliniks<sup>\*1</sup>, S. H. Cox<sup>1</sup>, J. E. Sawyer<sup>2</sup>, R. Worley<sup>3</sup>, and M. K. Petersen<sup>1</sup>, <sup>1</sup>*New Mexico State University, Las Cruces*, <sup>2</sup>*Texas A&M University, College Station*, <sup>3</sup>*Alderman-Cave Feeds, Roswell, NM*.

Utilization of a self-fed supplement that is effective at small amounts can minimize costs. Studies from NMSU have shown that it is possible to formulate and deliver a small supplement fed at 113.4 g/d to replace

use of a cottonseed meal supplement fed at 454 g/d in gestating beef cows on winter range with minimal weight loss. Sixty-eight yearling heifers (303 ± 1.4 kg) were used in a completely randomized design to evaluate consumption of a self-fed corn gluten meal (CGM) formulated small supplement in comparison to an animal protein (AP) based small supplement. The duration of this study was 4 months beginning in July and terminating in November. The study was replicated across 4 pastures of which 2 had been aerially treated with tebuthiuron and 2 were not treated. Heifers were allowed supplements ad libitum while grazing piñon-juniper/blue grama rangelands. During the study CP content (OMB) declined ( $P < 0.01$ ) in hand plucked samples (11.1, 9.1, and 6.7 ± 0.9 % for 12-July, 16-Aug, 3-Oct, respectively). Supplement CP and estimated UIP content ( $P < 0.01$ ) on an as fed basis for CGM and AP were 27.6 ± 1.5 and 16.4 ± 0.6, 37.2 ± 1.5 and 21.4 ± 0.6, respectively. The calculated bypass protein value for each supplement was 59.4 and 57.5% of CP for the CGM and AP mix respectively. Supplements were formulated by weight with 50% protein source and 50% mineral. Supplement disappearance from feed tubs was recorded each week to calculate consumption per head. Cow body weights were recorded at initiation of treatments and at 28-d intervals. Daily consumption was not different ( $P = 0.13$ ) between the CGM and the AP (150.3 and 175.8 ± 3.8 g head<sup>-1</sup>d<sup>-1</sup>, respectively). No differences ( $P = 0.16$ ) were found in total body weight gain. The pasture treatments did not influence consumption of either small supplement formula ( $P > 0.5$ ). Results from this initial study show that CGM small supplement mix can be used in place of an AP mix.

**Key Words:** Range Cows, Protein Supplementation, Corn Gluten Meal

**86 Effects of tallow supplementation to steers grazing wheat pastures on grazing and feedlot finishing performance.** A. Islas<sup>\*</sup>, T. Edwards, and S. A. Soto-Navarro, *New Mexico State University, Las Cruces*.

This experiment evaluated effects of tallow supplementation on steers grazing wheat pasture and subsequent feedlot performance. Forty-Five English cross steer calves (initial BW 328 ± 14.8 kg) grazed 9 paddocks in a 41-d grazing study. Five steers grazed each paddock within BW class (light, medium, heavy) and supplement treatment. Steers received 1 of 3 supplements during the grazing period: 1) mineral pack (M) offered at 114 g/d, 2) M plus fiber as soybean hulls-wheat middlings (MF) offered at 0.50 % BW, and 3) MF plus tallow (MFT) offered at 0.625% BW. Supplements were offered daily (0800) to each grazing group (5 steers/group). Following the grazing period, each group of steers was assigned to an individual feedlot pen, and they were fed a common finishing diet for 56-d. During the grazing period, supplement intake differed ( $P < 0.01$ ) as designed (113.1 g/d for M, and 0.48 and 0.59% of BW for MF and MFT, respectively). Grazing ADG was greater ( $P = 0.05$ ) for the steers receiving supplement compared with those receiving only M (0.90, 1.13, and 1.17 ± 0.06 kg/d, for M, MF, and MFT, respectively). During the feedlot period, ADG was not affected ( $P = 0.26$ ) by the supplement received during the grazing period (1.57, 1.69, and 1.51 ± 0.07 kg/d for M, MF, and MFT, respectively). Dry matter intake was greater ( $P = 0.10$ ) for M than for MF and MFT (14.5, 13.5, and 12.5 ± 0.06 kg/d, respectively). Steers receiving M were less efficient than those on MF and MFT as demonstrated by G:F ratio (0.109, 0.122, and 0.127 ± 0.007 for M, MF and MFT, respectively). Treatments had no effect ( $P \geq 0.41$ ) on hot carcass weight, marbling score, fat thickness, ribeye area, internal fat, or

yield grade. Treatments did not affect ( $P > 0.90$ ) the percentages of carcasses grading USDA prime or choice (66.7, 64.3, and 60.0 % for M, MF, and MFT, respectively). Tallow can be used for wheat pasture supplementation without adversely affecting performance. However, the performance response to tallow supplementation was similar to that of supplementing with highly digestible fiber.

**Key Words:** Wheat Pasture, Tallow Supplementation, Beef Cattle

**87 Interaction of forage type and level on conditioning of heifer calves for exportation.** G. Villalobos\*, F. Castillo, D. Domínguez, J. A. Ortega, and L. Carlos, *Universidad Autónoma de Chihuahua, Chihuahua, Chihuahua, Mexico.*

One problem of the cow-calf system in northern Mexico is the low weaning weight of the calves that are exported to USA. Post-weaning calf conditioning (30-60 d) before sale can be an alternative to improve exportation weight. The objective was to evaluate the effect of oat hay (OH) and corn stover (CS) at high (H) and low (L) levels on average daily gain (ADG), dry matter intake (DMI) and gain efficiency (GE) being the combinations oat hay high (OHH), oat hay low (OHL), corn stover high (CSH) and corn stover low (CSL). Fifty four weaned heifer calves Angus, Hereford and their crosses were used, averaging 210 d of age and 151 Kg initial body weight. Heifer calves were fed ad libitum with isoenergetic and isonitrogenous diets during 56 d. The calves were assigned to the groups with homogenous initial body weight, and randomly assigned to the treatment (OHH, OHL, CSH, and CSL;  $n = 13, 13, 14$  and  $14$ , respectively) and weighed every 14 d. In the last 14 d of the test, four calves of each treatment were randomly selected these were kept in individual stalls to measure DMI. Data for ADG was analyzed with PROC MIXED (SAS) in a 2x2 factorial arrangement and with initial weight as covariable. DMI and GE were analyzed with the PROC GLM. For ADG (Kg) the lineal response for each combination was different ( $P < 0.05$ ) (OHH:  $1.36 \pm 0.052$ , OHL:  $1.48 \pm 0.052$ , CSH:  $1.06 \pm 0.051$ , CSL:  $1.25 \pm 0.036$ ) at the end of the test, means for final body weight were: OHH  $218.09 \pm 1.73$ ; OHL  $218.41 \pm 2.92$ ; CSH  $220.64 \pm 2.88$ ; and CSL  $219.59 \pm 2.88$ . For DMI (Kg) covariable and forage level effects were found ( $P < 0.05$ ) (H,  $6.043 \pm 2.08$  and L,  $6.78 \pm 2.08$ ). For GE results ( $P > 0.05$ ) were: OHH  $3.87 \pm 0.33$ , OHL  $4.06 \pm 0.33$ , CSH  $3.98 \pm 0.33$ , CSL  $4.59 \pm 0.33$ . Higher ADG offer lower cost per kg gained and conditioning of heifer

calves before exportation is an alternative to improve profitability of the cow-calf system in Mexican cattle ranches.

**Key Words:** Oat Hay, Corn Stover, Weaned Heifer Calves

**88 Effects of supplemental ground flaxseed on the growth performance of steers grazing summer native pasture in the northern Great Plains.** E. Scholljegerdes\* and S. Kronberg, *Northern Great Plains Research Laboratory, USDA-ARS, Mandan, ND.*

The objective of this experiment was to evaluate the efficacy of supplemental flaxseed on increasing the growth performance of yearling steers grazing native range in the northern Great Plains. Eighteen Angus cross steers (avg initial BW  $368 \pm 4.6$  kg) were rotationally grazed on native range starting in June until September. Steers were allotted to one of three treatments that were grazing only (CON); cracked corn and soybean meal (65.2% corn, and 32.4% soybean meal, and 2.0% dried molasses fed at 0.29% of BW; CRN); or ground flaxseed (98% ground flaxseed and 2.0% dried molasses fed at 0.18% of BW; FLX). Supplements were individually fed and formulated to be isonitrogenous and isocaloric on a TDN basis. The experiment consisted of three 29 d experimental periods. Starting on d 20 of each period, steers were bolused with 5g of  $TiO_2$  after feeding and again 12 hours later until the end of the period. Starting on d 25 steers were fecal sampled at 0730 and 1930. Forage IVDMD was determined using six ruminally cannulated beef heifers allotted to similar dietary treatments and grazed with steers. There was a treatment  $\cdot$  period interaction for forage intake ( $P = 0.007$ ), ADG ( $P = 0.01$ ) and feed efficiency ( $P < 0.001$ ). Furthermore, cattle consuming FLX tended ( $P = 0.10$ ) to consume lower quality forage than either CON or CRN. Additional supplement tended to decrease ( $P = 0.11$ ) forage intake compared to CON and CRN consumed more forage ( $P = 0.03$ ) than FLX. However, ADG was greatest for supplemented steers ( $P < 0.0001$ ) compared to CON but did not differ ( $P = 0.47$ ) between CRN and FLX. Feed efficiency was greater ( $P = 0.001$ ) for supplemented steers and did not differ ( $P = 0.71$ ) between supplemented groups. Supplemental flaxseed is an effective source of energy for improving growth performance of grazing steers.

**Key Words:** Flaxseed, Grazing, Growth

## Physiology

**89 BioPRYN, A blood-based pregnancy test for managing breeding and pregnancy in cattle.** J. Howard\*<sup>1</sup>, C. Passavant<sup>1</sup>, D. Pals<sup>1,3</sup>, T. Gray<sup>2</sup>, N. Sasser<sup>1</sup>, G. Gabor<sup>4</sup>, A. Ahmadzadeh<sup>3</sup>, and G. Sasser<sup>1,3</sup>, <sup>1</sup>BioTracking LLC, Moscow, Idaho, <sup>2</sup>Holgate Land and Cattle, Plaines, TX, <sup>3</sup>University of Idaho, Moscow, <sup>4</sup>Research Institute for Animal Breeding, Herceghalom, Hungary.

BioPRYN is an enzyme-linked immunosorbent assay for detection of pregnancy-specific protein B (PSPB) in the blood of cows. Testing is available in 14 laboratories in the U.S., Canada and Hungary. The objectives of this study were to demonstrate the efficacy, practicality and rate of use of BioPRYN for cattle; to determine test sensitivity (SN, true pregnant [P] that tested P) and specificity (SP, true not P

[NP] that tested NP); and to test the pregnancy status in market dairy cows. Whole blood samples were collected and sera were analyzed by BioPRYN. In experiment 1, 336 dairy cows were pregnancy tested by ultrasound at 30 to 36 days and 37 to 43 days after artificial insemination (AI). There were 172 P and 164 NP cows. Serum was obtained at ultra-sounding at 30 to 36 days after AI. SN was 100% and SP was 88%. In experiment 2, 191 beef heifers were palpated to assure they were NP before estrous synchronization. Blood was taken at time of palpation. One heifer was detected NP by palpation but tested P by BioPRYN. This heifer aborted after estrous synchronization. All other heifers were detected NP by palpation; however, BioPRYN revealed two P with no evidence of abortion. BioPRYN SN and SP were 100 and 98.9%. In experiment 3, 208 Holstein cows were sold, primarily

due to NP status on the farm, at sale yards in West TX and Eastern NM. Only cows judged to be reproductively sound by palpation were purchased. BioPRYN showed that 51.9% were P. Number of cattle tested in all laboratories by BioPRYN was 58,000, 85,000, and 207,000 in 2004, 2005, and 2006, respectively. These results indicate that a) BioPRYN is a sensitive, specific and reliable test for pregnancy in beef and dairy cattle, b) greater than half of the dairy cows sold at sale yards are pregnant c) the rate of use of BioPRYN is increasing.

**Key Words:** BioPRYN, PSPB, Pregnancy Test

**90 Metabolic and steroid hormone concentrations in peripheral blood of overfed and underfed FSH-treated ewes.** A. T. Grazul-Bilska, J. S. Caton, E. Borowczyk, J. J. Bilski, J. D. Kirsch, D. A. Redmer, L. P. Reynolds, and K. A. Vonnahme\*, *North Dakota State University, Fargo.*

To determine the effects of energy in diet on serum concentrations of insulin, triiodothyronine (T3), thyroxine (T4) and estradiol-17 $\beta$  (E2), ewes (n=48; 59.4 $\pm$ 1.3 kg initial body weight [BW]; 2.3 $\pm$ 0.1 initial body condition score [BCS; score 1-5]) were divided into control (C; maintenance diet; n=14), overfed (OF; 2-C; n=17) and underfed (UF; 60% of C; n=17) nutritional planes for 8 wk before blood sampling and ovary collection. Ewes were individually fed once daily with pelleted diets containing 2.4 Mcal of ME/kg and 13% crude protein (dry matter basis). Control ewes were fed 760 g/d/50 kg BW. BW and BCS were determined every two wk during nutritional treatment. Follicular development was induced by twice daily injections of FSH on d 13 and 14 of the estrous cycle. Ovaries and jugular blood samples were collected on d 15 of the estrous cycle. For each ewe, number of follicles was determined. During the 8 wk experiment, C ewes lost 1.1 $\pm$ 0.9 kg, OF ewes gained 14.7 $\pm$ 1.1 but UF ewes lost 14.9 $\pm$ 0.9 kg, and BCS increased by 1.6 $\pm$ 0.1 for OF ewes, decreased by 0.7 $\pm$ 0.1 for UF ewes and did not change for C ewes compared with initial BW and BCS. Insulin serum concentration tended (P<0.145) to be greater in OF (4.6 $\pm$ 1.5  $\mu$ IU/ml) than UF (2.0 $\pm$ 0.1  $\mu$ IU/ml) ewes. Nutritional treatment did not affect serum T3, T4 and E2, ratio of T4:T3 or number of visible small and large follicles. These data show that: 1) overfeeding and underfeeding result in altered BW and BCS; 2) overfeeding tended to increase serum insulin concentration but not other hormones; and 3) nutritional treatment does not affect follicular development in FSH-treated ewes. Thus, high energy diets may enhance serum insulin concentration but not E2 and other metabolic hormone levels, while low energy diets do not affect E2 and metabolic hormones in sheep. Furthermore, the mechanism through which enhanced energy in diet may affect insulin levels, and potentially metabolic and reproductive function including embryonic survival, remains to be elucidated.

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**Key Words:** Metabolic Hormones, Nutrition, Sheep

**91 Superovulation in sheep: Number and weight of the corpora lutea (CL) and serum progesterone.** A. T. Grazul-Bilska, E. J. Windorski\*, J. S. Luther, J. J. Bilski, J. D. Kirsch, E. Borowczyk, K. A. Vonnahme, L. P. Reynolds, and D. A. Redmer, *North Dakota State University, Fargo.*

To compare luteal parameters between superovulated (SUP) and non-superovulated (Non-SUP) ewes, data from several experiments from 1988 through 2005 were analyzed. Ewes were mixed breeds, mature, non-pregnant, and either superovulated (n = 261) or non-superovulated (n = 84). To induce superovulation, ewes were injected twice daily (morning and evening) with FSH-P (Schering, Kenilworth, NJ, 1988 to 1994, n = 114; or Sioux Biochemical, Sioux Center, IA, 1996 to 2005, n = 147) on days 13 to 15 of the estrous cycle. At CL collection on d 5 or 10 of the estrous cycle, the number of CL was determined, each CL was dissected and weighed, and for selected ewes blood samples were collected for determination of serum progesterone (P4). 5.7% of ewes (n = 15) did not respond to FSH treatment ( $\leq$ 3 CL). The number of CL after treatment with FSH from two sources was similar, therefore the data were combined. Data are presented in the table below. Thus, despite some differences in CL number and weight, luteal function as determined by P4 production, is not altered by superovulation. Therefore, these data indicate that this superovulated ewe model produces CL that represent normal function.

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**Table 1.**

	Non-SUP	SUP
CL No	1.9 $\pm$ 0.1 <sup>a</sup> n=84	16.2 $\pm$ 0.5 <sup>b</sup> n=246 ewes
CL wt (mg) d5	225 $\pm$ 16 n=39 CL	252 $\pm$ 4 n=443 CL
CL wt d10	599 $\pm$ 19 <sup>a</sup> n=123 CL	380 $\pm$ 4 <sup>b</sup> n=936 CL
P4 (ng/ml) d5	1.3 $\pm$ 0.1 n=12	2.3 $\pm$ 1.1 n=5 ewes
P4 (ng/ml) d10*	3.8 $\pm$ 0.3 n=12	5.7 $\pm$ 1.3 n=10
P4 (per g of CL)** d5	0.2 $\pm$ 0.02	0.3 $\pm$ 0.05
P4 (per g of CL)** d10	0.7 $\pm$ 0.04	0.9 $\pm$ 0.3

<sup>a,b</sup>P<0.05, means $\pm$ SEM differ within a row; \*P4 values on d10 were greater than on d5, P<0.001; \*\*Calculated by dividing serum P4 concentration by luteal tissue mass per ewe.

**Key Words:** Superovulation, Luteal Function, Sheep